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Shannon & Wilson, Inc.	Mineral and Energy Resource Occurrence Report – Caliente, Rev. 1 (Submittal No. 7.8)	19 Jul 2007	05-00187

Section I. Submittal Information (includes above information)

Submittal Description and Revision Summary for Entire Submittal:

This report documents information collected from a literature review and field reconnaissance performed for the purpose of identifying occurrences of mineral and energy resources along the proposed Caliente alignment of the Nevada Rail Line for the Yucca Mountain Project.

Revision Summary:
Rev 0, 23 Jun 05: Original submittal
Rev 1, 19 Jul 07: Revised Appendix to address copyrighted material, and corrected text to reflect Appendix revisions and typographical errors

Special Instructions:

Section II. Data File Information (Add lines below if needed for additional files. Indicate "Last item" or "End of list" after last line used.)

Filename	Rev.	File Size	Description (File description and revision summary for file)	Application and Version/ Add-in or Extension and Version
_Cover 19 July 07.ppt	1	708 KB	Mineral and Energy Resource Occurrence Report Cover	MS Power Point 2003 SP2
SW-ColourMidWidth 100.ctb	1	5 KB	Mineral and Energy Resource Occurrence Report Cover	AutoCAD 2007
Spine 1.5.jpg	1	417 KB	Mineral and Energy Resource Occurrence Report Cover Spine	Corel PHOTO-PAINT 8.0 Image
_Spines 2007.dwg	1	298 KB	Mineral and Energy Resource Occurrence Report Cover Spine	AutoCAD 2007
BSC Logo.jpg	1	22 KB	Mineral and Energy Resource Occurrence Report Cover and CD Label Image	Corel PHOTO-PAINT 8.0 Image
_CD Labels 2007.dwg	1	619 KB	Mineral and Energy Resource Occurrence Report CD Label	AutoCAD 2007
CD Background 2007.jpg	1	1,280 KB	Mineral and Energy Resource Occurrence Report CD Label	Corel PHOTO-PAINT 8.0 Image
21-1-20102-034-Rev1-X.doc	1	285 KB	Mineral and Energy Resource Occurrence Report Cover Sheet	MS Word 2003 SP2
21-1-20102-034-Change-History-C-Min.doc	1	34 KB	Mineral and Energy Resource Occurrence Report Change History Sheet	MS Word 2003 SP2
21-1-20102-034-Rev1.doc	1	760 KB	Mineral and Energy Resource Occurrence Report Text	MS Word 2003 SP2
21-1-20102-034-T1-Rev.xls	1	86 KB	Table 1, Summary of Mineral Occurrences, Conflict Probability, and Phase 2 Recommendations	MS Excel 2003 SP2
21-1-20102-034-T2-Rev.doc	1	62 KB	Table 2, Definition of Mineral Resource Potential and Certainty of Assessment	MS Word 2003 SP2
21-1-20102-034-AX-Rev1.doc	1	25 KB	Mineral and Energy Resource Occurrence Report Appendix Flysheet	MS Word 2003 SP2
CalienteMinOcc Rpt,Rev1,Appx-NATIVE.*	1	507, 904 KB	Folder With Numerous MS Word, JPG, and PDF Files For Mineral and Energy Resource Occurrence Report Appendix	MS Word 2003 SP, Corel PHOTO-PAINT 8.0 Image, Adobe Acrobat 7.0

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Transportation Data Pedigree Form

Complete only applicable items.

Subcontractor:	Item Number/Title/Revision:	Submittal Date:	SRCT No.:
Shannon & Wilson, Inc.	Mineral and Energy Resource Occurrence Report – Caliente, Rev. 1 (Submittal No. 7.8)	19 Jul 2007	05-00187

Caliente_N&M_MEROR.mdb	1	4,852 KB	ESRI 9.2 Personal Geodatabase containing the following Shannon & Wilson, Inc. native files pertaining to studies related to the Mineral and Energy Resource Occurrence Report dated 19-Jul-07.	ESRI Geodatabase
CalienteMinOccRpt,R1,19jul07.pdf	1	9,795 KB	Adobe Acrobat Report	Adobe Acrobat 7.0
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Section III. Metadata

☒ **GIS Metadata** All GIS data is preferred in ArcGIS9.1 UTM, NAD1983, Zone11, Feet.	Projection: UTM Datum: NAD 83 Zone: 11 N Units: Feet
☐ **CAD Metadata** CAD drawings are preferred in **Bentley MicroStation V8 and/or InRoads** and should adhere to established **CAD standards**.	Level descriptions: Scale: Units of Measurement: Horizontal and Vertical Datum:

Section IV. Data Screening (Completed by BSC personnel)

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☒ Yes* ☐ No	Cathy Stettler	Cathy Stettler	8/23/07

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Section V. STR/STR Support Disposition of Submittal

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☐ Yes ☐ No**			
STR/STR Support Name: William Garfield		Signature: Wm. J. Garfield	Date: 8/27/07

KAM 8/24/07

Data Definitions for Mineral and Energy Resource Occurrence Report GIS Features (Caliente)

Feature Class: Spring Complex

Description: This polygon feature class represents spring complexes.

Purpose: Indicate areas of spring activity in the Caliente corridor

Revision History: No Changes. Data provided by Ninyo & Moore.

Number of records: 10

Feature Class: Specific_Evaluation_Areas

Description: Polygon feature class showing areas of evaluation during field investigations dating from June-October 2004 and April 2005.

Purpose: Identify areas of concern and investigation related to this report.

Revision History: No Changes. Data provided by Ninyo & Moore.

Number of records: 65

Feature Class: PaleoHotSprings

Description: Point features of paleo hot springs.

Purpose: Identify potential spring activity in the Caliente corridor.

Revision History: No Changes. Data provided by Ninyo & Moore.

Number of records: 6

Feature Class: PaleoColdSprings

Description: Point features of paleo cold springs.

Purpose: Identify potential spring activity in the Caliente corridor.

Revision History: No Changes. Data provided by Ninyo & Moore.

Number of records: 7

Feature Class: nvoil_01

Description: Point features showing oil and gas wells.

Purpose: To identify oil and gas wells in the Caliente corridor

Revision History: No Changes. Data provided by Ninyo & Moore.

Number of records: 742

Feature Class: mdist_p

Description: Polygon features showing areas of mining districts.

Purpose: To identify areas of mining districts in the Caliente corridor

Revision History: No Changes. Data provided by Ninyo & Moore.

Number of records: 535

Feature Class: mc_combo_placer_count

Description: Polygon features showing mining placer claims.

Purpose: To identify these claims in the Caliente corridor.

Revision History: No Changes. Data provided by Ninyo & Moore.

Number of records: 326

Feature Class: mc_combo_mill_count

Description: Polygon features showing mining mill claims.

Purpose: To identify these claims in the Caliente corridor.

Revision History: No Changes. Data provided by Ninyo & Moore.

Number of records: 68

Feature Class: mc_combo_lode_count

Description: Polygon features showing mining lode claims.

Purpose: To identify these claims in the Caliente corridor.

Revision History: No Changes. Data provided by Ninyo & Moore.

Number of records: 1820

Feature Class: geotherm

Description: Point features showing geothermal well activity.

Purpose: To identify the geothermal activity in the Caliente corridor.

Revision History: No Changes. Data provided by Ninyo & Moore.

Number of records: 165

Feature Class: 380913

Description: Polygon feature indicating mining claim areas with the "surface management notice of intent to operate" classification. This data is time sensitive and may no longer be accurate. Data was received in April, 2005 from Ninyo & Moore.

Revision History: No Changes. Data provided by Ninyo & Moore.

Number of records: 90

Feature Class: 380910

Description: Polygon feature indicating mining claim areas with the "surface management plans of operation" classification. This data is time sensitive and may no longer be accurate. Data was received in April, 2005 from Ninyo & Moore.

Revision History: No Changes. Data provided by Ninyo & Moore.

Number of records: 46

Feature Class: 362113

Description: Polygon feature indicating mining claim areas with the "mineral materials free use permit government" classification. This data is time sensitive and may no longer be accurate. Data was received in April, 2005 from Ninyo & Moore.

Revision History: No Changes. Data provided by Ninyo & Moore.

Number of records: 18

Feature Class: 361113

Description: Polygon feature indicating mining claim areas with the "mineral materials negotiated" classification. This data is time sensitive and may no longer be accurate. Data was received in April, 2005 from Ninyo & Moore..

Revision History: No Changes.

Number of records: 16

Feature Class: 360413

Description: Polygon feature indicating mining claim areas with the "mineral materials disposal (saleable free use permits)" classification. This data is time sensitive and may no longer be accurate. Data was received in April, 2005 from Ninyo & Moore..

Revision History: No Changes.

Number of records: 4

Feature Class: 321000

Description: Polygon feature indicating mining claim areas with the "geothermal leases non-competitive" classification. This data is time sensitive and may no longer be accurate. Data was received in April, 2005 from Ninyo & Moore.

Revision History: No Changes.

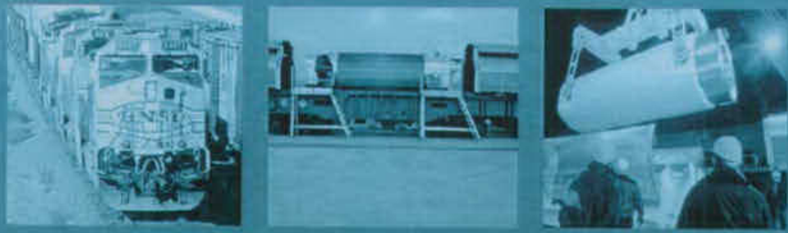
Number of records: 110

Feature Class: 311121

Description: Polygon feature indicating mining claim areas with the "oil and gas leases non-competitive" classification. This data is time sensitive and may no longer be accurate. Data was received in April, 2005 from Ninyo & Moore.

Revision History: No Changes.

Number of records: 590



Mineral and Energy Resource Occurrence Report Caliente Rail Corridor

SRCT:
05-00187

Task 3.4: Preliminary Mineral and Energy Resource Assessment Report (Submittal No. 7.8)

Rev. 1

Prepared by:

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GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

In Association With:

JACOBS

Ninyo & Moore

Prepared for:

BECHTEL SAIC COMPANY, LLC

Nevada Rail Corridor
Yucca Mountain Project
Geotechnical Analysis
NN-HC4-00197

July 19, 2007

Preliminary Mineral and Energy Resource Occurrence Report
Rev. 1
Caliente Rail Corridor
Yucca Mountain Project, Nevada

Subcontract No. NN-HC4-00197

19 July 2007

SHANNON & WILSON, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

At Shannon & Wilson, our mission is to be a progressive, well-managed professional consulting firm in the fields of engineering and applied earth sciences. Our goal is to perform our services with the highest degree of professionalism with due consideration to the best interests of the public, our clients, and our employees.

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21-1-20102-034

Prepared using MS-WORD 2003

CHANGE HISTORY

Revision Number	Date	Description of Change
00	23 June 2005	Initial Issue
01	19 July 2007	Revised Appendix and corrected text to reflect Appendix revisions and typographical errors

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2 Definition of Mienral Resource Potential and Certainty of Assessment

PLATE

Plate No.

1 Mining Districts and Mineral/Energy Occurrences

APPENDIX

Data Sheets and Selected Background Data (CD-ROM)

ACRONYMS AND ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
Ag	silver+
ANSI	American National Standards Institute
AREMA	American Railway Engineering and Maintenance-of-Way Association
As	arsenic
ASTM	American Society for Testing and Materials
Au	gold
AWWA	American Water Works Association
Ba	barium
Be	beryllium
Bi	bismuth
BLM	U.S. Bureau of Land Management
BMP	Best Management Practices
BNSF	Burlington Northern Santa Fe Railway Company
BSC	Bechtel SAIC Company, LLC
CAPP	Chemical Accident Prevention Program
Cd	cadium
cm	centimeter
Co	cobalt
CPT	cone penetrometer test
Cr	chromium
CRC	Caliente Rail Corridor
Cu	copper
DCM	Design Criteria Manual
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
EIS	Environmental Impact Statement
EOR	engineer of record
EPA	U.S. Environmental Protection Agency
F	fluorine
FEIS	Final Environmental Impact Statement
FHWA	Federal Highway Administration
FOB	free on board
FRA	Federal Railroad Administration
GCMC	Goldfield Consolidated Mines Company
G-DCM	Geotechnical Design Criteria Manual
GIS	Geographic Information System
gpm	gallons per minute
GPS	global positioning system
g/t	grams per ton

LIST OF ACRONYMS AND ABBREVIATIONS (cont.)

HASP	Health and Safety Plan
Hg	mercury
HSA	hollow-stem auger
H:V	horizontal to vertical
HSU	hydrostratigraphic units
IDW	investigation-derived waste
in/sec	inches per second
ISRM	International Society of Rock Mechanics
Jacobs	Jacobs Engineering, Inc.
K	potassium
km	kilometer
Ma	million years old or million years ago or million years before present
MGR	Managed Geologic Repository
MILS	mineral property location database compiled by the U.S. Bureau of Mines
mm	millimeter
mm/sec	millimeters per second
mm/yr	millimeters per year
MnO	manganese oxide
Mo	molybdenum
M&O	Maintenance and Operation
mph	miles per hour
MRDI	Mineral Resource Development, Inc.
MRDS	mineral resource dataset compiled by U.S. Geological Survey
MS	mineral survey
MSE	mechanically stabilized earth
MSEW	mechanically stabilized earth wall
MVGI	Metallic Ventures Gold, Inc.
N&M	Ninyo & Moore, Inc.
Na	sodium
NAC	Nevada Administrative Code
NBMG	Nevada Bureau of Mines and Geology
NDEP	Nevada Division of Environmental Protection
NDOT	Nevada Department of Transportation
Ni	nickel
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRL	Nevada Rail Line
NTS	Nevada Test Site
NTTR	Nevada Test and Training Range (formerly Nellis Air Force Base and Testing Range)

LIST OF ACRONYMS AND ABBREVIATIONS (cont.)

OCRWM	Office of Civilian Radioactive Waste Management
O.D.	outside diameter
opt	ounces per ton
oz	ounce, specifically troy ounce in this report
oz/t	ounces per ton
P	phosphorous
Pb	lead
PGA	peak ground acceleration
PM	particulate matter
ppb	parts per billion
ppm	parts per million
PSHA	probabilistic seismic hazard analysis
psi	pounds per square inch
PV	prefabricated vertical
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RFI	Request for Information
RFP	Request for Proposal
ROD	Record of Decision
ROE	right-of-entry
ROW	right-of-way
RSS	reinforced soil slopes
S&W	Shannon & Wilson, Inc.
Sc	scandium
SCS	Soil Conservation Service
Se	selenium
SFRS	steel fiber-reinforced shotcrete
Sm	samarium
Sn	tin
SPT	Standard Penetration Test
Sr	strontium
SSURGO	Soil Survey Geographic Database
T N	Township North
T S	Township South
Tl	thallium
tpd	tons per day
tpy	tons per year
tsf	tons per square foot
U	uranium

LIST OF ACRONYMS AND ABBREVIATIONS (cont.)

UPRR	Union Pacific Railroad Company
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
USBM	U.S. Bureau of Mines
USBR	U.S. Bureau of Reclamation
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
V	vanadium
W	tungsten
WPCP	Water Pollution Control Permit
wt%	weight percent
YMP	Yucca Mountain Project
Zn	zinc

PRELIMINARY MINERAL AND ENERGY RESOURCE OCCURRENCE REPORT

PHASE 1, CALIENTE RAIL CORRIDOR YUCCA MOUNTAIN PROJECT, NEVADA

1.0 INTRODUCTION

This report describes the results of a preliminary investigation to identify areas of conflict between occurrences of mineral and energy resources in known mineralized areas and a corridor to be considered by the U.S. Department of Energy (DOE) for a rail line for the Yucca Mountain Project (YMP).

1.1 Project Description

The DOE has announced the Caliente Rail Corridor (CRC) as its preferred route for a rail line in southern Nevada to transport spent nuclear fuel and high-level waste to a planned Managed Geologic Repository (MGR) at Yucca Mountain. The CRC is 0.25 mile wide and consists of common segments between various alternate routes. The rail line that is proposed by the DOE is referred to hereafter in this report as the Nevada Rail Line (NRL). The approximately 319-mile-long NRL would originate at the southern entrance to the MGR and would exit the southwest corner of the Nevada Test Site (NTS). It then wraps northward around the Nevada Test and Training Range (NTTR) and extends east to a location near Caliente, Nevada, where it would connect to existing Union Pacific Railroad (UPRR) mainline tracks. After completion of an Environmental Impact Statement (EIS), the DOE may select a final rail alignment to be constructed within the corridor. The railway to be built is expected to consist of a single track, with passing sidings at appropriate intervals.

1.2 Purpose

This report provides preliminary information to the NRL conceptual designers for evaluating whether known mineral and energy resource occurrences would likely constitute a potential conflict with alignment selection and construction. For this report, a mineral "occurrence" refers to any known mineral and energy resource occurrence, mining district, deposit, or known existence of such. The occurrence of a mineral resource does not necessarily imply that the mineral can be economically exploited or that it is likely to be developed.

Mineral and energy occurrences were classified according to whether they would likely present a low, medium, or high potential conflict to the NRL. The classified mineral and energy occurrences were then evaluated with respect to whether or not additional work is recommended for Phase 2 studies. Results of this preliminary limited investigation, in conjunction with recommended Phase 2 investigative work, can be used by BSC for evaluation of the proposed NRL alignments with respect to known mineral and energy occurrences.

This report does not address mineral and energy resource potential of areas along the corridor where there is little history of mineral extraction or where there is little current interest by the mineral industry. The Bureau of Land Management is currently preparing a Mineral Potential Report and an Environemntal Assessment of the entire Caliente Rail Corridor in response to an application by the DOE to withdraw these lands from mineral entry while the DOE studies the corridor for a rail line.

1.3 Scope of Work

The scope of work for this preliminary limited investigation consisted of conducting a study of known mineral and energy resource occurrences, traversed, adjacent to, or in the vicinity of the CRC. The various alignments under consideration are presented on Plate 1.

In general, the scope of work for this investigation included reviewing, analyzing, and compiling known mineral and energy resource occurrences, mining districts, and areas of recent mineral or energy resource interest and activity along the NRL; conducting an initial field reconnaissance of these identified areas; and preparing this report summarizing results of this investigation.

In the remainder of this report, the term "mineral occurrence" includes occurrences of energy resources (coal, geothermal, gas, oil, and uranium).

The following scope of work was performed:

1. Obtained, reviewed, analyzed, and compiled readily available mineral and energy occurrence data into a Geographic Information System (GIS) database, which was subsequently plotted on maps (Plate 1) and summarized in this report and on *district summary* data sheets (Appendix).

2. Interviewed knowledgeable persons at state, local and federal agencies with respect to available data and specific properties, and summarized the data in the report and on *interview* data sheets.

3. Interviewed knowledgeable persons and industry professionals to discuss specific mineral energy occurrences/properties that they may be familiar with because of previous or current experience, and summarized the data in the report and on *interview* data sheets.

4. Conducted a field reconnaissance of known accessible mineral occurrences, mining districts, and areas of known recent mining activity to generally verify office research; to fill in data gaps; to clarify inconsistencies in the data; to update potentially outdated information; and to evaluate historical, existing, and new areas of mineral interest, exploration, and development activity levels. This information was summarized in the report and on the *field data* data sheets.

5. Classified each of the mineral occurrences with respect to whether they would likely present a low, medium, or high potential to conflict with construction of the NRL.

6. Prepared this report with an accompanying plate and table indicating locations of identified mineral occurrences, mining districts, areas of recent mining activity or interests.

7. Evaluated the necessity for a Phase 2 investigation for each of the mineral occurrences identified, described the rationale for the work, and suggested the type of work that likely would be required. A Phase 2 investigation work plan will be submitted to BSC under separate cover and will provide more detailed information for the recommended scope for work.

In Section 7.0, Conclusions, of this report, each mineral occurrence is rated as to the likelihood that it creates a conflict with the construction of the NRL. A conflict between a mineral occurrence and the NRL may be created when a mineral occurrence is close enough to the alignment such that construction of the NRL would interfere with the development or exploration of the occurrence. In this report, the mineral occurrences are rated into whether they would, in the opinion of the investigators, create a low, moderate, or high conflict with construction of the NRL based on various factors. These factors include, but are not limited to, the level of current and past mineral exploration and development activity, reported mineral discoveries, existing rights to the occurrences, and the geology of the area in the vicinity of the mineral occurrence and the alignment.

Areas of low conflict typically occur where the mineral occurrence is far enough away from the alignment such that construction of the alignment has, in the opinion of the investigators, little chance of precluding mineral development or exploration. In addition, in some areas, the geologic environment in the vicinity of the NRL is unfavorable for mineral occurrences. Areas of low conflict typically do not have any records of preexisting rights.

In areas of moderate (or medium) conflict, the mineral occurrence is in proximity to the NRL, but not so far away that, in the opinion of the investigators, a conflict is likely to be created if the NRL is constructed. Areas of medium conflict might be areas where mineral exploration and development occurred in the past; however, the area is not currently of interest. Conflicts may also occur where the geology in the vicinity of the alignment, while not apparently unfavorable for mineral occurrences, no documented mineral occurrences close to the NRL exist. In these areas, additional exploration efforts may result in the discovery of a mineral occurrence within or close enough to the alignment such that a conflict is created in the near future, i.e., by the time the NRL is constructed.

In areas rated as having a high conflict, the alignment is directly on, adjacent to, or nearby documented areas of past and present mineral activity or areas with prior existing rights. In these areas, the geology is, in the opinion of the investigators, likely permissive for mineral occurrences. In some cases, these areas actually contain reported ore reserves under, near, or adjacent to the proposed alignment. In addition, in some of these areas, private interests have established a right to the mineral resources either through the mining and mineral leasing laws or the mineral materials sales program. For locatable minerals, these rights may have been established by staking mining claims and in some instances patenting mining claims. Patented mining claims are private property. In these areas, construction of the NRL could very likely have an impact on the development of the mineral occurrence.

The conflicts identified in this report are based on our evaluation of readily available information, existing concepts of geologic processes, current economic conditions, and records of existing mineral and energy encumbrances. With the passage of time, additional information may become available, economic conditions may change, and technologies may become available such that areas now ranked as having a low conflict could be ranked at a later time as having a high conflict. The converse is also possible.

1.4 Authorization

This work was performed in general accordance with the YMP Technical Services Subcontract NN-HC4-00197, Caliente Rail Corridor Geotechnical Analysis, effective 21 April 2004. Seven new alignment alternates came under consideration in early 2005. BSC issued Change Order No. 2 to the subcontract, effective 28 March 2005, authorizing us to include these alternates in our study.

This document was prepared under Work Unit 3.4 of the subcontract. The final version of this document is submittal number 7.7 of the subcontract.

1.5 Acknowledgements

The work scope for Task 3, including preparation of this report, was performed by Ninyo & Moore (N&M) under subcontract to S&W. In addition, S&W personnel assisted N&M in performing selected tasks. Paul Godlewski (S&W Project Manager) provided oversight for this task. Beth Abramson-Beck (N&M project manager) provided project management and directed this investigation. Beth Abramson-Beck, William Thomas Dodge (N&M project geologist), and Mark Edwards (N&M geophysicist), in conjunction with Ann Carpenter (independent consulting geologist under subcontract to N&M), obtained and compiled background data, conducted personnel interviews, and performed the initial field reconnaissance conducted in June and July 2004. William Thomas Dodge and Bruce Stover (S&W geologist) conducted the April 2005 field reconnaissance. William Thomas Dodge and Beth Abramson-Beck were the primary authors of this report. George Lightwood (S&W Task 2 Leader) was the S&W liaison with N&M and reviewed this report.

Gnomon, Inc. (under subcontract to N&M), provided several GIS databases, most importantly the topographic base, locations, and extents of mining districts from NBMG Report 47, as well as hot spring, paleo spring and geothermal well data shown on Plate 1. In conjunction with N&M, Gnomon, Inc. personnel prepared field maps 1 through 4. The information contained in these field maps is presented on Plate 1 of this report.

2.0 LITERATURE AND DATA REVIEW

2.1 Existing Data Analysis and Compilation

The majority of background data obtained and reviewed for this investigation, including locations and descriptions of mineral and energy occurrences, deposits, and mining districts, historical mining activities, and geologic information, were obtained from a combination of published data (maps, open file reports, professional papers, bulletins, and reports) and personal communications with industry professionals and knowledgeable government agency personnel familiar with mineral exploration or development activities on public and private lands.

Background and historical data obtained in the form of publications were primarily obtained from the following sources:

- Nevada Bureau of Mines and Geology (NBMG) geologic maps of the state, as well as for Nye, Esmeralda, and Lincoln Counties
- United States Geological Survey (USGS) bulletins, open-file reports, and professional papers
- NBMG survey maps, bulletins, open-file reports, and professional papers

Background information regarding individual mining districts and areas of potential mineral and energy occurrences were summarized onto Data Sheets classified as a *district summary* (Appendix). The *district summary* Data Sheets were used to help plan and conduct the field reconnaissance.

Published information regarding mineral and energy occurrences, while generally thorough, often is outdated. In addition to the historical data, more recent information regarding mineral and energy occurrences was acquired from the NBMG publication titled, *"The Nevada Mineral Industry 2003,"* and by visiting the internet web sites of the various mining companies that were identified as conducting mineral exploration activities in areas relevant to this investigation.

Personnel interviews were conducted by the project investigators before, during, and after the field reconnaissance. Persons interviewed included, but were not limited to, local residents, federal government agency representatives, mining industry professionals, prospectors, current and previous mine operators, and other persons knowledgeable of the area and its corresponding mineral occurrences. Interviews provided an overview and often specific information regarding the historical and recent mineral development in an area, and provided cross-reference to other information sources. Interviews provided additional information not found in publications and databases about current local mineral exploration or resource development.

Knowledgeable persons at state, local and federal agencies were interviewed to generally confirm that known sources of geologic and mineral and energy occurrence data have been obtained, to discuss specific mineral/mining properties/sites that they may be familiar with because of previous work/experience, and to obtain information regarding where recent mineral exploration work was/is being conducted.

When possible, the project investigators interviewed industry professionals who may have previously or are currently involved with mineral properties relevant to this investigation. In some cases, particularly for the Goldfield Mining District, project investigators were able to interview industry professionals currently conducting work in this district to obtain some of the latest, relevant mineral data as a result of their conducting office and fieldwork in areas of the NRL.

Personnel interview information was summarized onto an *interview* Data Sheet (Appendix). In general, the *interview* Data Sheets include information regarding who was interviewed, where they worked, their position, a summary of relevant information provided by the interviewee, and comments regarding recommended actions to be taken as a result of the interview, as applicable (e.g., the interviewee may have recommended additional persons to contact or places to visit in the field).

Mineral records from the U.S. Bureau of Land Management (BLM) LR2000 database were obtained from the Nevada State Office of the BLM and the Tonopah and Ely, Nevada field offices. These records were compiled for Esmeralda, Nye, and Lincoln Counties by BLM personnel and provided to the investigators in electronic format. Seven files containing mineral records were obtained from the BLM LR2000 database and included the following:

1. File 311121 – oil and gas lease (non-competitive).
2. File 321000 – geothermal leases (non-competitive).
3. Files 360413, 361113, and 362113 – locatable minerals permits (generally metal mineral resources, unique industrial minerals, sand and gravel).
4. Files 380919 and 380913 – surface management (plans of operation and notices of intent to operate).

These seven files are current as of September 2004 and were provided electronically for input into the GIS database. The records were compiled into map sheets so they could be used during the field investigations to identify areas of recent exploration activity. These data were also summarized into the map included with this report (Plate 1).

BLM personnel also provided electronic files summarizing mining claim records for lode, placer, and mill sites current through September 2004. These mining claim files were compiled for Esmeralda, Nye, and Lincoln Counties, and the information was incorporated into the GIS database and plotted on the field maps for use during the field reconnaissance. These data, broken down into the approximate number of claims per section, are also summarized on the map included with this report, referred to as Plate 1. For presentation of the number of claims per section on Plate 1, no attempt was made to account for claims with the same serial number appearing in more than one section, fractional claims, or multiple claim filings in the same section by different individuals of companies. In some cases, this results in a seemingly high number of claims in any particular section, considering the maximum legal claim size. The claim information provided in Plate 1 is for the purpose of indicating the level of mining claim activity and should not be used to estimate either the number of mining claims or the location of mining claims.

The BLM LR2000 database is considered preliminary and is a compilation of information added into their database through September 2004. The BLM does not warrant the accuracy, completeness, or reliability of the data; nonetheless, the data is useful for illustrating mineral exploration and development activity levels in the vicinity of the NRL.

Various GIS databases were obtained from the BLM, NBMG, USGS, BSC, Shannon & Wilson, Inc. (S&W), and Gnomon, Inc. The relevant information obtained from these databases used for this investigation included the following:

1. Caliente Rail Corridor (April 2004) and additional alternate alignments (March 2005), herein referred to as the NRL.
2. Topographic base map.
3. Boundaries of the NTTR and the NTS.
4. Boundaries of Wilderness Study Areas.
5. Township, range, and sections.
6. Boundaries of Nevada counties.
7. Locations of towns and cities.
8. Transportation infrastructure.

9. Fault locations and trends.

10. Locations of known spring complexes, hot springs, and warm springs.

11. Land ownership information (private and government lands).

12. Locations, delineations, and names of mining districts as defined by NBMG Report 47.

13. Locations of oil, gas, and geothermal leases.

14. Locations of locatable minerals permits (generally metal mineral resources, unique industrial minerals, sand and gravel).

15. Locations of plans of operation and notices of intent to operate.

16. Locations of mining claims, including lode, placer, and mill sites.

Esmeralda, Nye, and Lincoln Counties, and Nevada in general, have been the focus of mineral exploration, research, and mining over time. Many important sources of geologic data were used for this investigative study. NBMG Report 47, *Mining Districts of Nevada* (Tingley et al., 1998) provided information regarding the identification, location, and extent of known mining districts. This publication is generally considered by the mineral industry as the most recent and comprehensive inventory of mining districts in Nevada, and is considered a standard reference for the mineral industry. NBMG Open File Report OF 98-1, *Mineral and Energy Resource Assessment of the Nellis Air Force Range* (Tingley et al., 1998) similarly is a widely accepted publication for conducting mineral and energy resource assessments, and it was used to set the foundation for developing the general outline for this investigation, as well as for subsequent Phase 2 investigative work.

Important sources of background geologic and mineral data for each county generally included the following:

1. Early literature references to the geology and mining districts and properties within and adjacent to the NRL include reports for Nye County by Ball (1906 and 1907); Ransome (1909); Ransome and Emmons (1910); Ferguson (1917); Lincoln (1923); Couch and Carpenter (1943); Kral (1951); Cornwall and Kleinhampl (1961); Kleinhampl (1964); Schilling (1964); Bonham (1967); Cornwall (1972); Garside (1973); Papke (1973); Ekren, Quinlivan, and Marvin (1974); Tingley et al. (1998); and others.

2. Early literature references to the geology and mining districts and properties within and adjacent to the NRL include reports for Esmeralda County by Ball (1906 and 1907);

Ransome (1907 and 1909); Locke (1912); Lincoln (1923); Couch and Carpenter (1943); Kral (1951); Tingley et al. (1998); and others.

3. Early literature references to the geology and mining districts and properties within and adjacent to the NRL include reports for Lincoln County by Ball (1906 and 1907); Ransome (1909); Lincoln (1923); Callaghan (1936); Merrill and Gaylord (1940); Couch and Carpenter (1943); Bailey and Phoenix (1944); Trengove (1949); Cochran (1951); Kral (1951); Cornwall and Kleinhampl (1961); Longwell, Pampeyan, and Bowyer (1965); Tingley et al. (1998); and others.

Select references are included at the end of this report.

The Minerals Industry Location Systems (MILS) mineral records database and The Mineral Resource Data System (MRDS) mineral records database were generally reviewed, in electronic format, for Esmeralda, Nye, and Lincoln Counties. The MILS database provides information on locations of mines, their operational status, and the minerals at those locations. The MRDS database originates not only from USGS studies, but also from other federal and state agencies and primarily pertains to mineral commodities. The information in the MILS/MRDS database is not field verified. Based on similar studies conducted by the investigators, the information in these databases is often mislocated, contains duplicate entries, and is often incomplete. In addition, older entries in the database contain outdated information, and the level effort required to extract useful information from this database would have been beyond the scope of this study.

There is less published data for industrial minerals, sand and gravel, and stone/decorative rock occurrences because these types of operations typically are driven by periods of construction activity and, therefore, are cyclic. Existing publications generally contained more information about the larger metallic mineral occurrences, (e.g., large, producing or previously producing mines). Therefore, industrial minerals, sand and gravel, and stone/decorative rock occurrences are likely underrepresented in published data.

2.2 Land Status

Land status for the areas within and along the NRL generally includes the following:

1. Private properties, such as those owned by ranchers or private residences.

2. Lands administered by the BLM, including areas of surface management with plans of operation or notices of intent to operate designation; areas with mineral materials of either negotiated, disposal, or free-use designation; areas with geothermal (non-competitive)

designation; oil and gas leases (non-competitive) designation; and patented and unpatented mining claims (lode and placer).

3. Wilderness Study Areas.

4. DOD lands, including the NTTR.

5. DOE lands, including the NTS.

3.0 FIELD RECONNAISSANCE

Field reconnaissance was conducted in assessable areas identified as containing potential mineral occurrences that are traversed by, adjacent to, or in relative proximity to the NRL. The purpose of the field reconnaissance was to evaluate and document current conditions of the mineral occurrence, and to compare background data (e.g., information summarized on the *district summary* Data Sheet) with observed field conditions. The initial field reconnaissance was conducted during three separate time periods from June through October 2004. The initial field reconnaissance focused on evaluating mining districts and other identified areas of mineral occurrences, as supported by the background data and interviews conducted prior to and during the fieldwork.

A second phase of field reconnaissance was conducted for additional routes authorized under Appendix A, Revision 5, in March 2005. These seven new alignments were observed during a field reconnaissance trip conducted on 12 to 15 April 2005.

In general, areas of known mineral occurrences visited during the field reconnaissance were selected based on their proximity to the NRL. However, there was no specific minimum distance from the alignment that was used during the field reconnaissance. This was because numerous factors including, but not limited to, the size of the mineral occurrence, the type of occurrence, the presence of potential geologic or mineralizing structures, the recent or current minerals exploration/mining activity level in the area, and proximity of historical workings to the NRL also needed to be considered individually for each area evaluated. Known mineral occurrences that traversed or were within approximately 2 miles of the NRL were evaluated. Areas up to approximately 12 miles were also investigated on a case-by-case basis, as warranted, based on available background data or field observations. The mineral occurrences visited during the field reconnaissance and their distances from the NRL are summarized on Table 1.

In general, the mineral occurrences were visited based on the following criteria:

1. Areas identified as known mining districts according to the 1998 NBMG Report 47, titled *"Mining Districts of Nevada."*

2. Accessible areas identified on the topographic maps as being the site of generally historical mining or exploration activities (e.g., shafts, adits, prospect pits, quarry or open pit mines).

3. Accessible areas identified by the BLM LR2000 database as being the site of relatively recent or planned exploration/mining activity (e.g., areas where plans of operation and notices of intent had been filed with the BLM).

4. Accessible areas identified by the BLM LR2000 database as being the site of leases or containing mineral materials (e.g., areas of oil and gas, geothermal leases, or mineral permits).

5. Accessible areas identified by the BLM LR2000 database as being the site of lode or placer claims, or mill site locations.

6. Accessible areas identified based on interviews with local residents, government personnel, industry experts, or prospectors as being the site of relatively recent mineral exploration or mining activities.

7. Accessible areas based on the personal knowledge of the project investigators as a result of having conducted previous office or field mineral exploration activities.

8. Accessible areas observed during the field reconnaissance to be the site of what appeared to be relatively recent or current minerals exploration activities (e.g., recent mining claim posts or current exploration activity such as exploration drilling).

9. Accessible areas not traversed or adjacent to the NRL. For example, if a series of sand and gravel pits were observed 4 to 5 miles from the NRL, and the geologic setting at these locations was observed to be nearly identical to that which would be traversed or adjacent to the NRL, then our evaluation extended beyond the approximately 2 miles from the alignment to take into account this information. Similarly, if the geologic environment (such as geologic/mineralizing structures, host rock types, or rock alteration) that defined a particular mining district 5 to 6 miles away appeared to continue or extend toward the NRL, then our evaluation included investigating this mining district to take into account this information.

The scope of this study allowed for only a preliminary, general overview for each of the areas visited. Some areas were not accessed because of government agency restrictions, private property access issues, physical constraints, safety issues, and impassable or apparent absence of readily accessible roads. These areas include the entire Pocopah Mining District, the northeastern portion of the Transvaal Mining District; the northeasternmost portion of the Clarkdale Mining District, and portions of the Thirsty Canyon-Sleeping Butte Area. In addition, private property restricted access to portions of the Caliente area.

While in the field, each geologic inspector completed a Data Sheet classified as *field data* for each mineral occurrence examined during the field investigation (Appendix). While conducting this study (summarizing background data, conducting interviews, and performing field reconnaissance), the NRL was divided into four areas represented on four corresponding field map sheets, which from west to east were referred to as M1 through M4 (Field Map Sheets 1-4). For example, the Bare Mountain Mining District was referred to as M1-3 and corresponded to Map Sheet 1, location 3, of the field reconnaissance. One area or several areas may have been visited for each mineral occurrence or area evaluated, and separate *field data* Data Sheets were prepared for each of these areas. For example, in the Bare Mountain Mining District, referred to as M1-3, five separate areas were visited and were referred to as M1-3-FD1 through M1-3-FD5 (Appendix). For ease of review and report completeness, corresponding *district summary* Data Sheets summarizing compiled background data, and *interview* Data Sheets summarizing personnel interviews were organized together with the *field data* Data Sheets for each mineral occurrence/area (Appendix). For example, for the Goldfield Mining District, the area was previously referred to as M2-3 (Map Sheet 2 location 3), and there is a *district summary* Data Sheet (M2-3-DS), six separate personnel *interview* Data Sheets (M2-3-I1 through M2-3-I6), and five field reconnaissance *field data* Data Sheets (M2-3-FD1 and M2-3-FD5) (Appendix).

For presentation in this report, the four field map sheets were combined into one plate (Plate 1). The field map sheets are not included in this report as the information contained on them was compiled into Plate 1. The mineral occurrences evaluated during this investigation were subsequently assigned consecutive numbers (Map Locations 1 through 49), from west to east, as shown on Plate 1. However, the previous numbering system that corresponded to the four map sheets appears on the Data Sheets included in the Appendix. Table 1 includes a correlation of the numbering system used while conducting the field reconnaissance with that shown in Plate 1.

In general, *field data* Data Sheets summarized general field conditions observed, including general land use characteristics, surface geology, and characteristics of geologic units, including mineralizing systems and potential conflicts with respect to the NRL, and provided background data such as the location of the occurrence/area on a topographic base map; land use status; GPS coordinates, if applicable; location, direction, and distance of the NRL from the area visited; and, as relevant, a summary and follow-up recommendations. Photographs were taken of most areas visited to document general, current site conditions and are cross-referenced to each individual *field data* Data Sheet. For example, M2-3-FD1 (GMD)7 refers to Map 2, location 3, *field data* Data Sheet 1, photograph 7 in the Goldfield Mining District. Locations in the field were marked on USGS 1:100,000-scale metric topographic maps, or the 1:250,000-scale topographic maps generated by Gnomon, Inc., the GIS subcontractor. GPS coordinates were obtained for some of the areas visited during the reconnaissance and are referenced on the corresponding *field data* Data Sheets. Subsequently, GPS coordinates were not deemed necessary because the areas visited are approximate only and could be readily identified by reading the topographic base maps.

4.0 REGIONAL GEOLOGY AND TECTONIC SETTING

A geographical description of the Caliente Rail Corridor is presented in the Preliminary Geotechnical Report (Shannon & Wilson, Inc., 2005) prepared for Task 1. A discussion of the geologic setting, tectonics, regional seismicty, and hydrogeology are also presented there.

5.0 DESCRIPTIONS OF KNOWN MINERAL AND ENERGY RESOURCES

The following sections provide a summary of known mineral occurrences, an overview of the mining and prospecting history of Nevada, and summaries of relevant mineral and energy resource deposit models. The majority of information presented was obtained from Singer (1996) and Tingley et al. (1998).

5.1 Description of Known Mineral Deposits

The NRL traverses the southern and central portions of Nye County, the central portion of Lincoln County, and the easternmost portion of Esmeralda County in southern Nevada. The principal metallic and nonmetallic commodities produced in this part of the state include gold (Au), silver (Ag), lead (Pb), molybdenum (Mo), tungsten (W), mercury (Hg), petroleum, barite, fluorspar, and magnesite. Copper (Cu), zinc (Zn), antimony (Sb), arsenic (As), gemstones (chiefly turquoise), brines, talcose minerals, sand and gravel, clay, and dimension stone have been produced in minor quantities. Occurrences of some commodities for which there is no reported production include uranium (U), vanadium (V), selenium (Se), manganese (Mn), nickel (Ni), glass (perlite and pumice), silica, and zeolites (Tingley et al., 1998).

Energy resources primarily include Nevada's two producing oil fields located within Railroad Valley. The only oil fields in Nevada are at Eagle Springs and Trap Spring in Railroad Valley. Other hydrocarbons are also present, but not in any known commercial deposits (Kleinhampl and Ziony, 1984). Petroleum production and the known petroleum reserves are reported to be relatively small. Geothermal resources are present as hot springs and thermal waters encountered in drill holes near Warm Springs, Caliente, Beatty, Panaca, and other locations.

5.2 Mining and Prospecting

The search for minerals in Nevada has been ongoing, most likely beginning in the mid-1800s. Travelers probably first entered the study area through the Great Basin in the fall of 1849, heading for the California gold fields; however, reportedly, significant amounts of prospecting or mining activity did not occur. A few years later, John C. Fremont's final expedition in 1853 traversed portions of the study area, establishing a camp at Stonewall Spring. Fremont, at the time of his passage, described the physiography of the land, pronouncing it totally uninhabited from Cedar City, Utah, to the Sierra Nevada, noting again the general absence of significant mining activity.

The discovery of the Comstock Lode in 1859 prompted several waves of prospecting activity across the state, and resulted in many mineral discoveries along and peripheral to the study area. In Lincoln County, claims were staked in the old Worthington (Freiberg), Tem Piute, Groom, Bristol, and Atlanta Districts in the years before 1870. The now-abandoned gold camp of Delamar produced over $14 million in gold ore, chiefly between 1895 and 1909. The Bristol district produced over $3 million, principally in copper and lead, between 1878 and 1905.

Prospecting in the western portion of southern Nye County exploded following the discovery of rich silver deposits at Tonopah in 1900 and Goldfield in 1902. Prospectors fanned out across the ranges and playas, staking claims on precious metal discoveries at Silverbow, Wellington, Trappmans, and Wilson camps in 1904; at Gold Reed, Tolicha (Quartz Mountain), and Gold Crater in 1905; at Transvaal in 1906; and at Jamestown in 1907-1908. Wherever the initial discovery was particularly rich or well-promoted in Tonopah, Goldfield, or Beatty, a small rush of miners ensued, followed closely by purveyors of food, drink, lodging and supplies, forming a tent city mining camp of often hundreds of people within a short time. Most of these camps dwindled rapidly after a year or less to just the lessees who could pick out enough ore to pay their expenses, or sometimes the camps were completely abandoned. A brief resurgence in populations of these camps followed new strikes of rich ore, as at Antelope Springs in 1911 and Tolicha in 1917. The Silverbow District was somewhat anomalous in producing ore steadily over most of the years from its discovery until closure in 1942.

There was a brief surge in small-scale prospecting activity throughout the study area in the early 1930s when many unemployed workers left nearby towns to work claims in formerly abandoned mining camps. With the increase in prospectors on the ground came an increase in reports of new discoveries in the 1930s; the mining camp of Clarkdale came into being, and there was minor production in other older mining camps.

Portions of the areas adjacent to the study area were included within the withdrawal for the Las Vegas Bombing and Gunnery Range in 1940. This withdrawal effectively curtailed much of the mining and prospecting activity in these withdrawn areas; however, the increased wartime demand for metals boosted production in some mining districts open to mineral entry.

Relatively recent and current mining and exploration programs, including staking mining claims and conducting exploration activities such as geophysical work and drilling, have been conducted by mining companies from the 1960s to the present. Several of these programs have focused on areas with known mineralization, such as at the Silverbow, Goldfield, and Clifford Mining Districts. Although less common, some recent exploration efforts have been directed in areas where there appears to have been minimal earlier prospecting or mining activity, such as in the southern portion of the Reveille Valley and the South Monitor Hills.

The intensity with which mineral resources were and currently are explored and subsequently developed is guided primarily by market price, demand, and technological advancements in exploration and production. Through time, mining districts, as well as areas immediately surrounding these districts, have been the sites of resurgences in mineral exploration activities and mining, because of advancements in technologies and changes in the economic viability of potential undiscovered deposits.

5.3 Metallic Mineral Deposits

Mineral deposit models covering most metallic mineral deposits have been published by the USGS and others, and are those currently used and widely accepted by the mineral industry. The following summarizes these mineral deposit models.

Epithermal Precious Metal Deposits. Many of the world's most spectacular and historically significant precious metal deposits occur in intermediate to silicic volcanic rocks that are exposed in outcrops or are buried at relatively shallow depths. These types of deposits have been described by Burbank, Nolan, and Lindgren (1933); Wisser (1966); and many others. These deposits are generally related to volcanic processes and to the emplacement, cooling, and consolidation of the volcanic rocks that contain them. Many of them result from the eruption of molten material of the intermediate to felsic igneous systems, occurring along divergent plate boundaries, and are therefore related to orogenic belts. Associated rock types are basalts, dacites, rhyodacites, latites, and rhyolites in pyroclastic, welded pyroclastic, and flow regimes associated with ignimbrites, cauldron and caldera complexes, and other volcanic symptoms of volcanic belts.

Epithermal precious metal deposits form at shallow depths and low temperatures. Ore deposition is thought to occur within about 1 kilometer (km) of the surface in the temperature range of 50 to 200 degrees Celsius (°C), although deposition at temperatures up to 300°C are thought to be common. Economic ore deposits occur as siliceous vein fillings, irregular branching fissures, stockworks, breccia pipes, vesicle fillings, and disseminations. Drusy cavities, comb structures, crustifications, and symmetrical banding are frequently observed. The colloform, agatelike textures characteristic of epithermal deposits, presumably reflect moderate temperatures and free hydrothermal fluid circulation. The fissures have a direct connection with the surface, which allow the ore-bearing fluids to flow with comparative ease.

Volcanic-hosted, epithermal, precious metal deposits have been subdivided into high-sulfidation deposits and low-sulfidation deposits by Bonham (1989), White and Hedinquist (1995), and Hedinquist and Lowenstern (1994), and mineral deposit models have been developed for each. High-sulfidation deposits are characterized by extensive areas of argillic and advanced argillic alteration related to acid-leaching associated with low-pH hydrothermal fluids, surrounded by areas of propylitic alteration. Low-sulfidation deposits are typically associated with propylitic alteration and with quartz-carbonate deposition in main hydrothermal conduits. The magmatic source in low-sulfidation systems is typically at greater depths than in high-sulfidation types, resulting in a cooler and less reactive fluid, producing a more siliceous ore. In contrast, high-sulfidation fluids are derived from high-temperature vapors that condense in near-surface environments, producing hot, low pH fluids that react extensively with wall rock.

Sediment-hosted Gold Deposits. Sediment-hosted gold deposits were first recognized as a deposit type in the early 1960s (Roberts, 1986) and have been described by Percival et al. (1988), Bagby and Berger (1985), Bonham (1986), Singer (1996), and many others. They are well known for their large tonnage and large gold production despite their low grades. Gold from such deposits was produced with the development of the Carlin Mine in 1965, Cortez in 1968, and Jarritt Canyon in 1980. It was recognized that these deposits represent a separate class with a corresponding deposit model. An aspect of these deposits is that the dominantly metallic gold particles are so small that they are invisible to the unaided eye and thus detectable only by an assay rather than by inspection or panning.

Sediment-hosted gold deposits are hydrothermal, disseminated-replacement gold deposits, characterized by a high gold-to-silver ratio and a geochemical association of gold, arsenic, antimony, mercury, and thallium. Tungsten, barium, fluorine, tellurium, and zinc frequently occur. Anomalous amounts of tin and bismuth have been observed in several sediment-hosted deposits and may be present in a number of others. The preferred host rocks for high-grade disseminated ore include carbonaceous, silty, thin-bedded and laminated carbonate or carbonaceous, calcareous siltstone. Ore-grade mineralization also occurs, typically as stockwork breccias, in intrusive rocks, skarn, argillite, siltstone, sandstone, chert, and hornfels.

Spatially associated with nearly all sediment-hosted gold deposits are intrusive rocks ranging in composition from diorite, lamprophyre, monzonite, granodiorite to quartz monzonite porphyry occurring in dikes, sills, plugs, and stocks in the vicinity of the deposits. The intrusive rocks are commonly altered and mineralized and, in some cases, contain economic mineralization. Silicified rocks, including massive jasperoid, are present in essentially all sediment-hosted gold deposits. The jasperoids and silicified rocks typically exhibit fractures suggesting hydrothermal brecciation and silicification. Jasperoids may occur either as a capping above, within, peripheral to, or below the main ore zone. In addition to silicification, alteration may include decalcification of carbonate rocks, argillization, and pyritization of host rocks. Common alteration minerals include quartz, illite, kaolinite, chlorite and sericite.

Regional controls on the occurrence of Carlin-type deposits are major lineaments, along which a number of deposits occur in a linear array. The deposits may also occur in anticlinal and domal structures related to Mesozoic folding. Mine-scale controls on ore deposition are high-angle faults that act as conduits for hydrothermal solutions and transect favorable lithologies, anticlinal folds, and the presence of tectonic, hydrothermal, and collapse breccias.

Epithermal Manganese Deposits. Mosier (1986) described epithermal manganese mineralization as commonly occurring as veins and fracture fillings in volcanic rocks of varying compositions. His model includes deposits having both manganese oxides and manganese carbonate minerals, as well as calcite, quartz, chalcedony, barite, and zeolites.

A subtype of epithermal manganese mineralization is one in which the manganese was apparently deposited originally as hypogene manganese oxide minerals. In this type of deposit, the mineralization consists of seams, fracture fillings, and veins of wad or psilomelane with minor pyrolusite, milky chalcedony, calcite, and quartz.

Epithermal manganese deposits are reported to have anomalous amounts of manganese, iron, and phosphorus, and in some deposits, one or more of the following: lead, silver, gold, copper, and tungsten. However, they are not known to have been mined for these metals. Tungsten has been produced from hot spring manganese deposits (Kerr, 1940).

Hot Spring Mercury Deposits. Deposits of cinnabar and native mercury within hydrothermally altered volcanic and volcanic-sedimentary rocks are included in the hot-spring-mercury deposit model described by Rytuba (1986). Deposits consisting of disseminated grains and fracture-coatings of cinnabar +/- native mercury, are found in areas containing shallow acid-sulfate alteration of the steam-heated type and are associated with kaolinite, alunite, cristobalite, opal, iron oxides and native sulfur. They are also found within hot-spring silica sinter formed at the paleosurface, and with pyrite, zeolites, quartz, chlorite, and potassium feldspar below the water table of active and fossil geothermal systems.

Polymetallic Vein Deposits. In the deposit model for polymetallic veins, Cox and Singer (1986) relate polymetallic veins to felsic intrusions with associated quartz-carbonate veins containing gold and silver with associated copper, lead, and zinc. The veins occur in or adjacent to intrusions ranging in composition from diorite to granite with porphyritic to equigranular texture. The veins may occur peripheral to porphyry copper-molybdenum deposits. Vein mineralization may contain electrum, sphalerite, galena, chalcopyrite, pyrite arsenopyrite, tetrahedrite-tennanite, and silver sulfides or sulfosalts in a gangue of quartz and carbonate. The veins may exhibit mineral and metal zoning with an inner copper-gold zone sometimes with tungsten, zoning outward to copper-lead-zinc-silver ores, then to lead-zinc-silver, and in some veins, to an outer antimony-arsenic-mercury zone. The veins are typically multiphase with crustiform, comb, and massive textures.

Associated alteration in igneous host rocks includes narrow areas of sericitic or argillic alteration as vein envelopes, surrounded by a broad halo of propylitic alteration. The veins may be associated with polymetallic replacement deposits in areas where they intersect carbonate rocks. Ore controls are areas of enhanced permeability such as high-angle faults and breccias, and intrusive contacts. Polymetallic veins may be of any age, but are most frequently Mesozoic or Tertiary.

Polymetallic Replacement Deposits. Morris (Cox and Singer, 1986) described a model for polymetallic replacement deposits. The host rocks for these types of deposits typically consist of limestone, dolomite, or shale in the vicinity of porphyritc intrusions. Mineralogy of polymetallic replacement deposits can be simple or complex ranging from deposits where the principal carbonate replacement ore bodies contain pyrite, argentiferous galena, sphalerite, and manganosiderite to deposits that are zoned around a porphyry copper-molybdenum system. The ore bodies are typically surrounded by jasperoid containing barite.

Polymetallic replacement bodies may grade into base metal skarns, as in many of the Mexican manto deposits. Hydrothermal alteration in carbonate rocks is manifested by dolomization of limestone and silicification (jasperoid). Associated igneous rocks are argillized, propylitized, or sercitized. Orebodies are localized by faults or favorable beds; impermeable horizons such as shale beds, channels or caves; and by either tectonic, hydrothermal or solution cavity breccia. Orebodies may be either tabular (mantos) or podlike, or form pipes. They are commonly stratiform and sometimes stratabound. Exploration criteria include geochemically anomalous jasperoid, and carbonate rocks in the vicinity or porphyritic igneous rocks.

Porphyry Copper-molybdenum and Calc-alkaline Molybdenum Deposits. This ore deposit model is of relatively recent definition and is significant because of its overall economic impact. While the term copper-molybdenum porphyry was used in the ore deposit literature as early as the 1920s (Parsons, 1933 and 1957), many of the geologic, mineralogic, geochemical, and zonal characteristics of the group were not established until the 1960s and 1970s. Porphyry copper-molybdenum deposits, by definition, are associated with porphyritic intrusions. The deposits may occur in stockworks within the intrusions or in adjacent silicate wall rocks. In some districts where porphyries have been emplaced into carbonate wall rocks, the ore bodies are dominantly in skarns or polymetallic replacement deposits. An overriding feature of the porphyries is that they are very large hydrothermal-petrogenetic systems that influence cubic kilometers of rock.

The porphyries range in composition from diorite to tonalite, syenite, granodiorite, monzonite, and quartz monzonite. The porphyry stocks are commonly cylindrical-shaped, typically 1 to 2 km in diameter, and may consist of several intrusive pulses closely related in space and time. The ore occurs both in quartz-sulfide stockworks and as disseminated sulfides in the porphyries. Early hypogene alteration, associated with the main copper-molybdenum stage, consists of a central core or potassic alteration grading outward into a halo of propylitic alteration. This early hypogene alteration, related to magamatic fluids, may be overprinted by quartz-sericite-pyrite alteration created principally by circulation meteoric water. The upper part of many porphyry systems, when preserved, typically exhibits advanced argillic alteration in silicate rocks.

Sulfides are predominantly pyrite, chalcopyrite, bornite, and molybdenite. Magnetite is commonly present. Some porphyry deposits can be classified as copper-gold because they contain > 0.4 parts per million (ppm) gold (Sillitoe, 1988). Gold is typically present as electrum, but occurs as a telluride in enargite-rich upper levels of porphyry systems. In addition to copper and molybdenum, geochemically anomalous elements in many, but not all, porphyries include gold, silver, bismuth, tellurium, zinc, lead, boron, selenium, strontium, rubidium, potassium, arsenic, and antimony. Some porphyries contain elevated levels of platinum group elements. Each intrusive pulse in a copper-molybdenum porphyry system contains its own metal budget. Hydrothermal breccia pipes are typical of many porphyries and may contain significant ore deposits.

Calc-alkaline porphyry molybdenum deposits occur in granite or rhyolite porphyries. Their deposit characteristics are essentially the same as described above, except that molybdenite predominates over chalcopyrite in the quartz-sulfide stockwork veinlets that form the porphyry orebodies.

Supergene copper enrichment may form copper orebodies in some deposits. The phenomenon of supergene enrichment is a remarkably special case of weathering that necessitates starting with rock that is porous and permeable to meteoric waters, contains abundant pyrite to produce oxidizing acids, contains acid-soluble ore-metal-bearing minerals, and is underlain by a precipitative environment. This process is important to economic geology and the mining industry, because metals leached from the oxidized upper parts of mineral deposits can be redeposited and concentrated at depth. Even more important, this process provides a mechanism by which a small percentage of metal can be leached from a large volume of rock and, provided the conditions below are favorable, can be redeposited as a higher-grade deposit in a smaller volume of rock.

Skarn Tungsten Deposits. The tungsten mineral scheelite occurs in calc-silicate contact metasomatic rocks, according to the model described by Cox (Cox and Singer, 1986) for skarn tungsten deposits. Rock types include tonalite granodiorite, quartz monzonite intrusive rocks, and carbonate and calcareous clastic wallrocks. Deposits form as irregular or tabular bodies in carbonate rocks or calcareous rocks near igneous contacts. Associated igneous rocks are commonly barren. Alteration is mainly silicification, and alteration minerals include diopside-hedenbergite plus grossular-andradite in a central zone, wollastonite with or without tremolite in an outer zone, and a peripheral marble zone. Minerals present may include scheelite, molybdenite, sphalerite, chalcopyrite and pyrite with traces of wolframite and fluorite. The geochemical signature of this type of deposit is tungsten, molybdenum, zinc, copper, tin, bismuth, beryllium, and arsenic in some combination.

5.4 Non-metallic (Industrial) Mineral Deposits

Non-metallic mineral deposit models covering most industrial mineral deposits have been published by the USGS (Orris and Bliss, 1991) and are those currently used and widely accepted by the mineral industry. The following summarizes these industrial mineral deposit models.

Barite. Barite (barium sulfate) is the most abundant naturally occurring mineral containing the element barium; however, barite is typically used in the refined natural mineral form. In some types of deposits, barite contains up to several weight percent strontium, which substitutes for the barium, and barite may be finely intergrown with other minerals, such as quartz or carbonate minerals. The high density of barite, its relatively inert chemical properties, and its abundance have made it an important industrial mineral commodity. The bulk of barite consumed in the world is used for production of high-density oil and gas well-drilling muds, which cool and lubricate drill bits, clean and stabilize drill holes, and help contain high-pressure oil and gas. Barite is also used in glass manufacturing as a high-density filter and weighting agent in plastics and rubber and, when bleached, as a pigment. The mineral is also used as radiation shielding and as an indicator in X-ray photography.

Commercial deposits of barite may be divided into four types: bedded, vein, karst, and residual. Bedded barite deposits are the most commercially attractive because they may be relatively large and high grade. Most bedded barite deposits occur in Paleozoic sedimentary sequences that typically contain abundant chert, black shale, and siltstone. The most favored explanation is that bedded barite deposits were formed as a chemical precipitate from hydrothermal brines discharged at the sea floor during deep-sea sedimentation.

Vein-type barite deposits exhibit great variation in size and geometry, from long, relatively narrow, tabular veins to stockwork vein or breccia deposits. Vein barite occurs in many different host rocks that range from Precambrian to Tertiary in age. Most barite in vein deposits is associated with sulfide minerals such as pyrite, galena, and sphalerite, and with other minerals such as quartz and calcite, and often contains fragments of wallrock. Vein barite deposits are mostly considered to have formed from low-temperature epithermal solutions.

Residual barite deposits are shallow, surface concentrations of unconsolidated material formed from weathering and erosion of other deposits. The size and grade of these deposits is highly variable.

Borate Minerals. The bulk of world boron production comes from the minerals borax, kernite, colemanite, and ulexite in continental sedimentary deposits (Kistler and Helvaic, 1994). Large borate deposits are bedded deposits contained in lacustrine sediments deposited in closed basins. These deposits generally form in arid to semiarid climates, which promote evaporative concentration of borates during deposition.

Most borate mineral production comes from large open pits, but borates are also mined underground and boron is extracted from brines. Boric acid is produced by most operations, but the greatest use is in the production of glass, fiberglass insulation, and other glass fiber products for which boron minerals such as colemanite can be used directly. Borate is also used in household products, insecticides, metallurgical fluxes, fillers, and fire retardant materials.

Building and Decorative Stone. Building and decorative stone is defined as rock that is sold in finished shapes for specific uses. This type of commodity may be quarried in large blocks that are later cut for further finishing, or it may be sold in natural or broken pieces that remain unfinished and are used for paving or other purposes. Building and decorative stone is mainly used in the construction of buildings, monuments, and civil structures, and in landscaping.

Dimension stone is a type of building stone that is cut to specific sizes. This includes all building stone that is cut or broken to specific dimensions, often on all sides. Surfaces may be textured, smoothed, or polished to specifications and can take many forms. Tile and facing sheets are made from thin panels of stone that often have some form of surface. Large finished blocks of dimension stone are prepared as monumental stone, which includes grave markers and statuary. Stone shaped into irregular pieces along natural fractures can be used for wall construction and roofing slate. Large blocks of rough-hewn stone can be used in the construction of retaining walls, seawalls, and bridges.

In general, commercial building stone comes from economically accessible deposits of durable rock that contains few fractures. The use of rock as building stone is principally governed by a combination of unique physical properties, cost, and aesthetic appeal. Aesthetic appeal has always been difficult to define and quantify, and may change with trends in decoration and architecture. Technical specifications and standards define acceptable physical properties of building stone and form the basis for the selection of natural stone for construction applications.

Silica. Silica is probably more diversified than any other nonmetallic mineral. Most silica sand is used in the manufacture of glass, and in foundry sands used to cast iron-, aluminum-, and copper-base alloys (Bolen, 1992). Silica sand and lithified varieties of silica are used in refractory sands and abrasives, for metallurgical applications as fluxes, and for filtration and oil well fracturing. Ground silica is used in fillers and extenders.

Silica is mainly mined from quartz sand, quartz pebble, sandstone, and quartzite deposits in the United States; minor production comes from chert or novaculite (cryptocrystalline quartz) deposits, quartz pegmatites, and quartz veins. Cryptocrystalline silica is mainly produced in minor amounts for abrasive applications such as whetstones, and for grinding media in pebble mills. Quartz veins are mined in small amounts for optical and electronic quartz, but in the past, large quartz vein deposits were mined for metallurgical and refractory silica.

Clay. Clay is a natural, fine-grained material that is composed mostly of one or more of a group of minerals known collectively as the clay minerals. Clay minerals are hydrous silicates composed mainly of silica, alumina, and water. Some clay minerals contain significant amounts of alkali metals, alkali earths, and iron. As mineral commodities, clays can be classified into several distinct groups, and clay commodities are subdivided into common clay, bentonite, kaolin, and hormites. Most clays are mined from open pits with waste-to-clay ratios ranging from 0.25:1 for common clays to 7:1 for Kaolin (Virta, 1993). A small number of clay mines are underground operations.

Common clay is mainly used in construction products such as bricks, roofing tiles, and Portland cement. It is also used in pottery and as filler in paint. The term includes a variety of naturally occurring clay minerals, including illite, kaolinite, and smectite.

Bentonite is composed of one or more varieties of smectite (chiefly montmorillonite). High-swelling or sodium bentonites have active colloidal properties, forming gel-like matter when added to water. They are widely used as a drilling mud, and as a binder in foundry sand and pelletized iron ores. High-swelling bentonites are relatively rare in the United States, and only minor amounts of such clay come from Nevada. A non-swelling magnesian bentonite, saponite, is produced in moderate amounts in Nevada.

Kaolin has many industrial applications, including uses as fillers, coating agents, extenders, binders, and whitening agents, and in ceramics. Eight deposits of kaolinite and the related clay mineral halloysite are found in Nevada (Papke, 1973).

Hormite clays include the minerals palygorskite, which is mined in large amounts in Georgia and Mississippi, and sepiolite, which is mined in moderate amounts in Nevada. These are magnesian clays with fibrous structure that are used mainly as absorbents and in saltwater drilling.

Construction Aggregate (Sand and Gravel). Construction aggregate consists of a variety of materials used in Portland cement concrete, asphalt concrete, fill, road base and loose road surfacing, railroad ballast, concrete block, and stucco. Mined natural materials provide most of the construction aggregate used in the United States, although recycled materials such as crushed glass and smelter slag are used, as well as manufactured lightweight aggregate. Sand and gravel, crushed stone, and volcanic cinders are mined materials that are currently used for construction aggregate in Nevada.

Sand and gravel are mined from unconsolidated stream-channel, floodplain, or terrace deposits; alluvial fan deposits; glacial or glaciofluvial deposits; and beach deposits of lacustrine or marine origin. In southern Nevada, almost all sand and gravel production is from alluvial fan deposits, with minor production from fluvial deposits in active stream channels. Sand and gravel that is ideally suitable for most construction aggregate is composed of clean, uncoated, properly shaped and sized detritus that is sound and durable. Individual sand and gravel particles must be resistant to physical stress and to chemical and physical changes. Sand and gravel that contains excessive amounts of clay, organic matter, soluble minerals, or friable altered and weathered particles may be removed by screening and washing. Sand and gravel deposits that contain reactive rock types, such as certain siliceous volcanic rocks, may not be suitable for use in Portland cement concrete without special treatment (Goldman, 1994).

Many different rock types are used in crushed stone, and the types used are determined mainly by availability and rock quality. Such rock types must meet the same, or more stringent, soundness and durability requirements for sand and gravel, and therefore must not contain reactive minerals or be weakened by alteration. However, extremely hard or abrasive rock types are generally not used in crushed stone because of high crushing and screening costs. For most uses, it is important that the rock break into more-or-less equant fragments when crushed, and platy rocks such as slate generally make poor aggregate. Certain mineral components, such as mica in some schists, are deleterious in aggregate because they cause structural weakness. Some types of crushed stone are particularly desirable for specific uses. For example, fine-grained basalt is commonly used in asphalt concrete, and crushed rhyolite is used in lightweight Portland cement and in concrete blocks. As is the case with sand and gravel, certain silicious volcanic rocks, including rhyolitic ash-flow tuffs, are unsuitable for Portland cement concrete aggregate because of alkali-silicate reactivity (Malisch, 1978).

Volcanic cinder deposits are composed of loose fragments of scoriaceous basalt or andesite, generally found in relatively young cinder cones. Because they have low density, but are relatively strong structurally, volcanic cinders are used in lightweight aggregate for Portland cement concrete and in concrete block. High-quality cinder deposits adjacent to metropolitan markets (generally in the western United States) are prized because of low mining and crushing costs. Cinder finds minor use as decorative stone and barbecue rock.

Mining of all construction aggregate, whether for sand and gravel, crushed rock, or volcanic cinders, is by open-pit methods. Because most sand and gravel deposits consist of unconsolidated material, drilling and blasting is not required, whereas crushed stone generally is produced from quarries where drilling and blasting is required to loosen rock so it can be excavated.

Fluorspar. The commercial name for the mineral fluorite is "fluorspar." Pure fluorite contains 51 percent calcium and 49 percent fluorine and is used extensively in mineral form; it is the raw material for most of the world's fluorine compounds. There are three market grades of fluorspar: acid-grade fluorspar (acidspar), used to manufacture hydrofluoric acid, which is an intermediate product in the manufacture of industrial fluorine compounds; ceramic-grade fluorspar, mainly used in glass making; and metallurgical-grade fluorspar (metspar) that is mainly used as metallurgical flux. Acidspar typically contains not less than 97 percent calcium fluoride and less than 0.10 percent water, 1.5 percent silicon dioxide, and 0.10 percent sulfur. Ceramic-grade fluorspar requires a minimum of 97 percent calcium fluoride, under 3.0 percent silica, low calcium and iron, and only traces of lead and zinc. In the United States, metspar generally contains at least 60 percent "effective" fluorspar, not over 0.30 percent sulfide sulfur, and less than 0.50 percent lead.

Most past production of fluorspar in Nevada has come from replacement deposits in Paleozoic carbonate rocks, but significant production has come from a vein deposit in Tertiary volcanic rock and breccia pipe deposits in Paleozoic rock (Papke, 1979).

Gypsum. Gypsum (hydrated calcium sulfate) and its non-hydrated counterpart, anhydrite, deposits are a member of a group of chemical sediments called evaporites. The name is at once genetic and descriptive, covering a group of rocks formed by the process of evaporation. Evaporites include gypsum, halite, potash, borates, and trona. Both marine and lacustrine evaporates are quite common in the geologic record. Marine evaporates total over 3 percent of the total stratigraphic thickness of sedimentary rocks, and are known back into the Precambrian. Lacustrine evaporates are widespread in fault block and other depressions in modern desert environments, but because of their fragile, specialized nature they are not well represented in the ancient stratigraphic record. Gypsum is mined in large amounts, mainly for use in wallboard, Portland cement, and agricultural products.

Halite/Saline Minerals. Halite (sodium chloride), commonly know as table salt, is an important industrial commodity that is said to have over 14,000 different reported uses. Most of this commodity is used by the chemical industry, although large amounts are also consumed in food processing and road deicing. Halite is produced from bedded or salt dome deposits, and sodium chloride is extracted from brine. Halite beds and small salt domes occur in Tertiary sedimentary rocks in Nevada.

Limestone/Dolomite. Limestone and dolomite are calcium and calcium-magnesium sedimentary carbonate rocks that are very important and useful in the construction industry and for chemical and industrial use. Neither rock often occurs pure in nature, as dolomite substitutes for calcite in limestone and calcite substitutes for the mineral dolomite in dolomite rock. The name "limestone" and "dolomite" include rocks consisting of at least 80 percent carbonate without regard to whether the carbonate is calcite, the mineral dolomite, or a combination of both. Calcite greatly predominates in limestone, and dolomite predominates in dolomite rock. When calcite and dolomite are present in more or less equal proportions, the rock is termed magnesian limestone. High-calcium limestone contains at least 95 percent calcite.

Marble, which is limestone or dolomite that has been naturally recrystallized, often has the same chemical and mineralogical composition as the original carbonate rock, or it may contain new minerals formed during the metamorphic process. Marble is almost always more coarsely crystalline than the original carbonate rock. An economically important physical quality of some marble is its ability to take a smooth polish.

Limestone, dolomite, and marble of either composition is used as: (1) crushed stone for concrete aggregate, road material, railroad ballast, in a finer form for poultry grit, stuccos, fillers, and whitening agents; (2) a fluxing agent in metallurgical processes; (3) soil conditioner to reduce soil acidity in agriculture; (4) a source of lime; (5) a chemical raw material in manufacturing glass, acid neutralization and other chemical processes; and (6) as dimension stone. Limestone, but not dolomite, is used as the basic raw material ingredient in the production of Portland cement. Dolomite, but not limestone, is an important ingredient in high-grade refractories.

Lithium. Lithium is the lightest of all the metals. It is used in metallic form in light metal alloys and batteries, and as organic compounds in lubricants and pharmaceutical products. However, its main use is as lithium carbonate, which is the form that is produced from brines, and in ceramics, glass, and aluminum reduction (Kunasz, 1994).

Popular theories on the genesis of the lithium brines in representative deposits include three sources: influx of hot brines with lithium ultimately coming from a magmatic source, chemical weathering of lithium-rich pegmatites in the region, and leaching of lithium from volcanic rocks. Transport of lithium would thus come via hydrothermal fluid, surface water, or meteoric groundwater that leaches lithium from rocks. Evaporation concentrates the lithium in the brine to an economic grade. Alternatively, lithium precipitates to form an evaporate sediment, which can then be dissolved by fresh water to make brine from which the lithium is extracted

Perlite. Perlite refers to a glassy volcanic rock of rhyolitic composition that has a perlitic (onionskin or pearl-like) structure. Typical perlite contains 2 to 5 percent combined water and, when heated to a specific temperature, "pops" or suddenly expands like popcorn to produce a lightweight cellular product that has many commercial applications. When grains of crushed perlite are abruptly heated to the temperature of incipient fusion, their contained water is converted to steam and they form light, fluffy, cellular particles. The volume of the crude perlite may be expanded 4 to 20 times at temperatures from 1,400 to 2,000 degrees Fahrenheit (°F). The optimum temperature at which a given perlite will "pop" depends on both its water content and its chemical composition. Variations in the composition of the glass affect the softening point, type, and degree of expansion; size of the bubbles and wall thickness between them; and the porosity of the product. Further composition will affect whether the expanded material will be fluffy and highly porous or a glazed, glassy particle having a low porosity.

Expanded perlite is graded by bulk density. The most widely used grades range in bulk density from 7 to 15 pounds per cubic foot. Color, appearance, and fluffy versus glassy are important considerations in many end uses.

Expanded or "popped" perlite finds important uses in many products and industrial applications. The more important uses are in the construction industry for insulation, lightweight concrete aggregate, acoustical plaster and tile, wallboard, and other formed products; in filter media; in agriculture as a fertilizer extender, insecticide carrier, and soil conditioner; as a filler for paper and plastic products; as a texturizer in paints; and as an abrasive.

Siliceous volcanic flow rocks (typically rhyolitic in composition) commonly contain segregations of volcanic glass, but their "popping" characteristics must be determined.

Pumice and Pumicite. Pumice and pumicite are acidic, glassy volcanic materials having a chemical composition similar to that of rhyolite or dacite. They are often referred to as volcanic ash, dust, tuff, rhyolite sand, and pumiceous rhyolite. Pumice differs from pumicite in the mode of formation and textural characteristics. Both are normally white to light gray and are composed primarily of silica with lesser amounts of alumina, potash, soda, lime, magnesia and iron oxide. In general, they are chemically inert, but can be reactive when in a very fine, granular condition. Basalt, scoria and cinders, although significantly different in composition, are included under this heading.

Pumice is a highly cellular, dull, glassy material. The open cavities or cells are separated by thin glassy walls. Because of its sponge-like character, dry pumice is lightweight, and many fragments and blocks of pumice will float on water. Pumice originates from molten lava that is highly impregnated with water vapor and other gases. The release of pressure upon extrusion of the lava allows the gases to expand, and the rapid cooling of the molten material preserves the mass of gas bubbles. Silica-rich lavas solidify at high temperatures and thus are found close to centers of volcanic activity. Deposits of pumice are found as irregular, lens-like bodies closely associated with other volcanic flows near major vents.

Pumicite, on the other hand, consists of finely divided, closely packed, angular, glassy fragments ranging downward in size from about ⅛ inch to extremely fine powder. Despite the fineness, pumicite will sink in water. It originates as volcanic ejecta, blown into the air by volcanic eruptions. The airborne particles are sorted in weight and size by gravity and wind and, after falling to the earth's surface, may be further sorted by wind and water action. Thus, pumicite may occur thinly spread over wide areas or in thick accumulations in local basins. In either case, the deposition can be distant from the original source.

Pumice and pumicite are used both in the crude and processed forms. The principal uses are for concrete aggregate and admixtures, decorative building blocks, landscaping, road construction and maintenance, and industrial abrasives. A variety of miscellaneous uses includes dilutants; absorbents (including pet litter and oil-absorbing floor sweep); carriers for insecticides, herbicides, and fungicides; soil conditioners; fillers and extenders for paints and plastics; thermal insulation medium; roofing granules; and laundry scouring compounds.

Zeolites. Zeolites are a collective name for a group of over 30 minerals, which are hydrated aluminosilicates of the alkali and alkaline earth elements. They have a framework structure that encloses interconnected cavities occupied by the relatively large cations and water molecules. The cations and water have considerable freedom of movement, which gives the zeolites their cation exchange and reversible hydration properties. The porous character of the zeolites enables them to act as molecular sieves for the separation of molecular mixtures based on the size and shape of the molecular compounds or for the selective adsorption of gasses.

These unique properties suggest diverse industrial uses in processes such as purification and drying of gasses and liquids, chemical separations, catalysis, solar energy, and decontamination of water treatment plant effluent and radioactive wastes.

5.5 Energy Resources

The following summarizes the four main categories of energy resources including geothermal, uranium, coal, and petroleum (oil and gas) currently recognized and widely accepted by the mineral industry.

Geothermal. Geothermal energy is derived from the natural heat of the earth. Although the earth is a great reservoir of heat energy, most of it is buried too deeply or is too diffuse to be used as an economic energy source using current technologies. Heat flow is the product of the thermal conductivity of the rock (a physical property) and the thermal gradient (temperature difference). Heat flow is the amount of heat leaving the earth per unit area. Geothermal resource areas are commonly found in areas of anomalously high heat flow; thus, such measurements of heat flow or flux are used to evaluate regions for geothermal energy potential. In some hot springs systems, geothermal energy is concentrated at depths shallow enough and temperatures hot enough for use. Such use includes the generation of electric energy (high temperatures applications) as well as low and moderate temperature uses such as for space heating and industrial process heat.

The Basin and Range is considered a favorable area for geothermal resources because it has higher–than-average heat flow and is an area of crustal expansion, where faults can provide permeable reservoirs and conduits for deep circulation of water and the crust is thin so it has a higher than average heat flux. In Nevada, several hundred wells have been drilled to discover and delineate high-temperature geothermal steam prospects. Lower-temperature prospects have been explored for projects such as alcohol production, food drying, and commercial and residential district heating systems, and for space heating in single-family residences.

Uranium. Uranium is an important energy source because of one isotope, uranium 235, which upon splitting (fission), releases large amounts of energy. This readily fissionable isotope makes up about 0.7 percent of natural uranium. Igneous rocks and uranium have a long and intimate association. The Great Basin has many areas with igneous rocks and consequently has over 500 known occurrences of uranium minerals in the region. More that half of these are related to the periods of widespread volcanic activity that occurred in the region during the Cenozoic time period. The remaining occurrences are found in association with the Mesozoic intrusive igneous rocks.

The uranium minerals that typically occur in the igneous rocks are usually too disseminated to make commercial deposits. In some areas, the volcanic rocks were uplifted during Basin and Range faulting and exposed to weathering. This erosion released the uranium from the volcanic rocks. Circulation of oxygen-rich groundwater through these weathered rocks incorporated and carried the uranium. When the uranium-enriched groundwater reached an environment without oxygen, the uranium was precipitated and concentrated in the test rock, typically fine- to medium-grained sandstones.

Uranium that is released from silicic volcanic rocks may be concentrated at certain sites in the volcanic sequence themselves. Peralkaline volcanic rocks are commonly enriched in incompatible elements, including uranium. Hydrothermal disseminated and vein-type deposits may form in caldera environments, especially those of peralkaline affinity (Wallace and Roper, 1981). Silicic volcanic centers, including those that erupt alkali rhyolites, are also candidates for hydrothermal, volcanic-hosted uranium deposits (Burt and Sheridan, 1981). Uranium mineralization is also likely in ash-flow tuffs, if suitable concentrating mechanisms are present (Garside, 1973).

Coal. No known commercial deposits of coal exist in Nevada, and no significant coal has occurred in the last 75 years. However, because coal was valuable for mining and milling, and for steam railroad locomotives, it was actively sought in the state from the earliest mining activity to the 1920s. Coal was produced during this period out of necessity; however, the ability of railroads to deliver coals from other areas made Nevada coal deposits uneconomic. Nineteenth- and early twentieth-century reports of many coal deposits were for the purpose of promoting development and attracting investors and often overstated the quality, quantity, and production.

The presence of coal in Nevada is confined to certain Tertiary lacustrine units, mainly in the northern part of the state, and Mississippian clastic rocks in eastern Nevada. The Chainman Shale and related rocks of eastern Nevada contain beds of coal at several localities; most of these were discovered during the early mining development of the state.

Petroleum (Oil and Gas). Studies undertaken to assess the likelihood for the existence of petroleum in Nevada has been generally based on known production, shows of oil or gas in exploratory wells and at the surface, proximity to areas of potential source and reservoir rocks, and the thermal maturity of the source rocks (Sandberg, 1983 and 1993). Using these parameters, areas of medium or high potential are located in the eastern part of the state, where the majority of the potential source rocks are found, and where these rocks have not been heated beyond the petroleum-generation window to temperatures where hydrocarbons would be destroyed. Western Nevada consists predominantly of rocks, which are not good source rocks, in part because of the common occurrence of intrusive igneous rocks. The source rocks that are present are overmature because of metamorphism or heating by igneous intrusions. Some Tertiary sedimentary units in this area are undermature because of the lack of deep burial. Because the Basin and Range province is a structurally and stratigraphically complex region, its geology is relatively poorly understood compared with petroleum provinces in basins with simpler relationships and considerably more subsurface information. Because there are a great variety of potential reservoir types in the Basin and Range, petroleum potential is best evaluated by outlining areas containing source rocks, which are within the petroleum generation window, and thus may have provided petroleum to adjacent reservoirs. Rocks that are thermally overmature are not known to be associated with preserved petroleum provinces elsewhere in the world. The presence of traps, by themselves, is not enough evidence to rate an area prospectively valuable for petroleum. It must first be demonstrated that adequate source rocks exist, and then that they may have been heated enough to generate petroleum. As reported by French (1994), the search for hydrocarbons in this region is essentially a source-rock driven play.

6.0 KNOWN MINERAL AND ENERGY RESOURCE OCCURRENCES ALONG THE NRL

Each mining district, prospect, occurrence, or area of interest with respect to potential mineral occurrences that were the subject of the initial field reconnaissance in June and July 2004 are numbered sequentially and discussed below in order of west to east along the NRL. Areas that were the subject of the field reconnaissance in April 2005 are included as part of the previous June-July 2004 field reconnaissance when the areas fall close to areas already subject to the initial field reconnaissance. Areas where the proposed alignment was not covered by the previous field investigation are discussed in order of west to east along the alignment at the end of discussion of the initial field reconnaissance (Plate 1). Background information, including district summaries, field data sheets, photographs, and interviews for each area, are included in the Appendix. Mining district boundaries as presented in NBMG 47 were used when providing distances of areas evaluated during the field reconnaissance from the NRL.

6.1 Pocopah Mining District (Plate ID No. 1)
Mining District or Area Name, Location, Map Reference Number

The Pocopah Mining District, also known as Forty Mile Canyon, Quartz Mountain, and Calico Hills, referenced in this report as Plate ID No. 1 is located on the NTS, north of Jackass Flats, in southern Nye County. The western boundary of the Pocopah Mining District is approximately 2¼ miles east of the easternmost NRL on the NTS. This mining district was not visited during the field investigation, because we did not have permission to enter the NTS.

History of Discovery, Exploration, and Mining. Reportedly discovered in 1904, newspaper references from 1904 to1907 refer to claim activity in the Pocopah Mining District east of Forty Mile Canyon in the Calico Range. The district was described as being about 4 miles by 8 miles in extent (Bullfrog-Beatty Miner, 1906). Little else is known regarding the early history of the district.

According to recent reports, three shafts and five prospects are located on the mined portion of the district, and there are no intact buildings or mine structures. A complete absence of roads in the area, indicating an early date of activity, was also noted (Tingley et al., 1998).

More recent exploration activities in the district include the 1978 drilling of a 2,500-foot-deep borehole along the southwestern side of the Calico Hills. The drilling was performed in an attempt to characterize an intrusive that had been identified by geologic, aeromagnetic, and regional gravity data. The primary objective of this project was to identify a large homogeneous rock mass having the right characteristics for a high-level nuclear repository. The drill hole penetrated argillites for the first 1,360 feet and was in marble thereafter. Both units were determined to be in Mississippian Eleana Formation. The suspected intrusive was not identified based on the drilling efforts (Maldonado et al., 1979).

A mineral inventory of the NTS and portions of the NTTR (formerly the Nellis Bombing and Gunnery Range) was conducted in 1984 by the NBMG. Field mapping of local and regional geology, sampling and mapping of aboveground mine workings, sample analysis, and the compilation of data into report form were performed and submitted to the DOE under contract DE-AS08-82NV10295.

Generalized Geologic Description. Most of the surface exposures within the district are highly altered and brightly colored tuffs that are bleached and iron stained, resulting in vivid shades of orange and red that can be seen from great distances. According to Maldonado et al. (1979), the Calico Hills are part of a dome, elongated in a northeastern direction. The extensive radial fracturing along the margins are attributed to the doming and to high-angle basin-and-range faulting. The oldest rocks within the structure are Devonian dolomites (Devils Gate Formation) that were thrust over argillites and quartzites of the Mississippian Eleana Formation. The assemblage is overlain unconformably by rhyolite flows and tuffs of Miocene age. The central core of the structure has been intruded by small rhyolite plugs that form small resistant knobs of brecciated or highly silicified material (Orkild, 1970; McKay, 1964).

Mineral/Energy Occurrences. The mineral occurrences reported for this district are copper, gold, silver, and magnesite (Tingley et al., 1998). Three shafts and five prospects reportedly are located on the western side of a dome structure and are in limestones and dolomites of the Devonian Devils Gate Formation. These upper plate rocks are highly fractured and are crosscut by quartz and calcite veins. The mine workings are along vein-filled fractures. These veins display gossans on outcrop and consist of quartz, which carries chalcopyrite, pyrite, malachite, azurite, and other minor sulfides (Tingley et al., 1998).

Prospects in the central and southeastern parts of the Calico Hills area are along contact zones and associated with brucite and minor barite mineralization. Surface examinations and assays from these sites revealed no anomalous mineralization (Tingley et al., 1998).

The following information is based on a 27 July 2004, interview with Mr. Chris Lewis, Sample Management Facility Manager, Yucca Mountain Project (Appendix). Reportedly, not much information has been located to date regarding this district, because it appears there was little to no production from the district workings.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflict between the NRL and the Pocopah Mining District based on the following:

- The Pocopah Mining District lies entirely within the NTS.
- Distance between the rail corridor and known historically mined areas of the district. The western boundary of the district is approximately 2 to 3 miles east of the easternmost NRL.
- Small, narrow, localized areas (radial fracturing) of possible copper, gold, silver, and magnesite mineralization.
- Apparent trends of structures controlling mineralization and favorable rock types do not appear to trend toward the NRL.
- Nevada Bureau of Mines and Geology Open File Report 84-2, A Mineral Inventory of the Nevada Test Site, and Portions of Nellis Bombing and Gunnery Range Southern Nye County, Nevada, (Quade, Tingley et al., 1984) reported that surface examinations and sample assays of prospects in the central and southeastern parts of the district revealed no anomalous mineralization.

6.2 Crater Flat Area (Red Cone, Black Cone to Steve's Pass) (Plate ID No. 2)

Mining District or Area Name, Location, Map Reference Number. The Crater Flat area extends along the central portion of Crater Flat, between Bare Mountain and Yucca Mountain, and is referenced in this report as Map ID No. 2 (Plate 1). The NRL is located approximately 2 to 7 miles northeast of the Crater Flat area.

History of Discovery, Exploration, and Mining. The Crater Flat area does not appear to be defined formally as a mining district. Available data reviewed did not provide information regarding the history of discovery, exploration, and mining of the area.

Field reconnaissance of the Crater Flat area identified an active quarry operating on a cinder cone similar in appearance to Red and Black Cones. This area was observed from U.S. Highway 95 and is approximately 12 miles south of the NRL.

Generalized Geologic Description. Two deposits of volcanic cinders are found in the Crater Flat area. The largest forms an asymmetrical cone approximately 1,800 feet in diameter. It is composed of reddish-brown to black, lightweight scoria cinders that average less than 1 centimeter (cm) in diameter, although large blocks are present near the center of the cone.

Basaltic flows, scoria agglomerate, and ash flows extend northward and eastward from the base of the cone. The other deposit is a cinder cone about 1,200 feet in diameter that contains cinders identical in color, density, and particle size to the larger cone. These cones are part of a northeast-southwest trending series of cinder cones referred to as the Crater Flat area.

Mineral/Energy Occurrences. The Quaternary basalts in Crater Flat have been described by Cornwall and Kleinhampl (1961) as trachytic basalt with phenocrysts up to 2 mm long of labradorite, olivine, and a little hypersthene and augite. The ground mass consists of trachytic laths of labradorite, about 0.15 mm long and anhedral to subhedral grains up to 0.1 mm of pigeonite, hypersthene, augite, magnetite, ilmenite, some interstitial glass, and in a few units, biotite.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflict between the NRL and the Crater Flat area based on the relatively large distance between known industrial (cinder) occurrences and the NRL.

6.3 Bare Mountain (Fluorine) Mining District and BW3 (Plate ID No. 3)

Mining District or Area Name, Location, Map Reference Number. The Bare Mountain Mining District, also known as the Fluorine District and referenced in this report as Plate ID No. 3 (Plate 1), includes all of Bare Mountain and adjoins the Bullfrog District to the west and the Carrara District to the southeast, in southern Nye County. The northern portion of the district and the location of the majority of historical mining activity are approximately 2 to 5 miles east of the town of Beatty. The highest point in the Bare Mountains has an elevation of 6,235 feet. The southwesternmost NRL alignments (BW1 and BW3) traverse the northeastern portion of the Bare Mountain Mining District, and the vast majority of historical mining activity has occurred more than 2 miles south of these NRL alignments. Portions of the northeastermost alignment (BW2) traverses the northeasternmost area of the mining district.

History of Discovery, Exploration, and Mining. Gold ore reportedly was discovered on the east slope of Bare Mountain in 1905, and the camp of Telluride sprang up. The Bull Moose property produced gold ore from 1913 to 1915. Cinnabar was discovered by J.B. Kiernan and A.A. Turner on the east flank of Bare Mountain in 1908. In 1912, a 10-ton Scott mercury furnace was erected there by Telluride Consolidated Quicksilver Co., which made small annual productions from 1912 to 1915. In 1913, opal-containing cinnabar from this deposit was cut for gem purposes. A few carloads of kaolin were shipped from three properties to a California pottery plant in 1917 and 1918. Fluorspar claims in the Fluorine district were located in 1918 by J. Irving Crowell and sold to the Spar Products Corporation, which gave the Continental Fluorspar Co. a 20-year lease. The first fluorite production of Nevada was made in 1919 when 700 tons were shipped by the Continental Co. In 1920, 632 tons of fluorite were shipped.

While large amounts of fluorspar have been mined, a small production of mercury, ceramic silica, volcanic cinders, and pumicite has been recorded. Meager showings of gold, silver, and tungsten have been found in several prospects, but no production has been recorded. Unsuccessful attempts have been made to quarry marble at Carrara Canyon, 7 miles southeast of Beatty, and perlite, approximately 3 miles east of Beatty.

The following information regarding four properties in the Bare Mountain Mining District was obtained from the *Nevada Mineral Industry, 2003*. Additional information regarding these properties is provided in the Appendix of this report.

At the Sterling Gold Property, southeast of Beatty, Imperial Metals Corp. reportedly completed 17 drill holes. Results of this drilling program reportedly expanded the 144-foot zone to 500 feet by 750 feet. The 144-foot zone is approximately 700 feet below surface and remains open in all directions. The following table provides information regarding ore reserves/resources and production history of the Sterling Gold Property.

Deposit Name	Reserves/Resources	Production History
Sterling (Bare Mountain District)	1983: 200,000 tons, 0.20 opt Au 1989: 469,000 tons, 0.21 opt Au 1996: 129,000 tons, 0.245 opt Au	1983-88: 75,900 oz Au 1990-91: 24,841 oz Au 1995-98: 36,811 oz Au 1999: 3,093 oz Au

At the Daisy Mine, owned by Glamis Gold Ltd., the following information was obtained from the *Nevada Mineral Industry*, (2003) regarding ore reserves/resources and production history of the Daisy Mine.

Deposit Name	Reserves/Resources	Production History
Daisy (Bare Mountain District)	1993: 4.7 million tons, 0.024 opt Au *geologic resource* – 430,000 oz Au 1998: 4.2 million tons, 0.033 opt Au proven and probable reserves	1997-98: 64,504 oz Au 1999: 30,660 oz Au 2000: 8,740 oz Au 2001: 347 oz Au

At the Reward Property, owned by Glamis Gold Ltd., the following information was obtained from the *Nevada Mineral Industry,* (2003) regarding ore reserves/resources and production history of the Reward Property.

Deposit Name	Reserves/Resources	Production History
Reward Property (Bare Mountain District)	1998: 77,500 oz Au	(no data provided in reference)

For the Nevada Mercury Deposit located in the Bare Mountain Mining District, it appears that the most recent work conducted on this property was approximately 10 years ago, in 1994.

Deposit Name	Reserves/Resources	Production History
Nevada Mercury (Bare Mountain District)	1994: *geologic resource* – 50,000 oz Au	(no data provided in reference)

An undated Glamis Gold Ltd. website contained the following information regarding the Daisy and Reward properties. The Daisy open-pit mine, consisting of 18.2 square miles located in Nye County, began production in 1997 and, in its second year of operation, produced and sold 32,504 ounces of gold. Daisy is proving to be a cost-effective operation, as its cash operating costs were reduced from $301 per ounce in the first year of operation to an estimated cash operating cost of $230 per ounce (including royalty) in 1998. An additional sulfide resource has been delineated at the Daisy Mine. The Reward Project is currently being developed and gold production is planned for late 1999. The Reward Project will extend Daisy's mine life to 2002 (Glamis Gold Ltd., undated).

The following information was obtained regarding the Sterling Property from the Imperial Metals Corporation website (Imperial Metals Corporation, 2005). Reportedly, Sterling operated both as an underground and open pit mine commencing in 1980 and operating through 2000, producing 194,996 troy ounces from 941,341 short tons of ore with an average grade of 0.217 ounces per ton gold (oz/t) 7.44 grams per ton (g/t). The Sterling project claims and mine site cover approximately 3,700 acres (approx 1,500 hectares). Imperial Metals Corporation initiated an exploration program in 2000 involving regional geochemical sampling and gravity geophysics aimed at finding gold anomalies or prospective stratigraphy worthy of follow-up drill testing. In 2001 the discovery of a deep, high-grade gold zone, 144 Zone, in a setting, that exhibits many of the hallmarks of the structurally controlled Carlin-type deposits, represented a totally new setting for gold deposition on this property. Two borings encountered gold mineralization in silty carbonates at the contact between the Bonanza King dolomite and the Carrara limestone. The depth of these intercepts is approximately 700 feet (213 met) below surface and some 300 feet (91 metres) below the lowermost underground workings at Sterling. In 2002, a surface rotary and diamond drill program further tested the target area, followed by a geophysical survey. In 2003, 30 holes totaling 9,000 feet (2,743 metres) were completed. All holes, which penetrated the zone, intersected elevated gold values enlarging the 144 Zone to 500 feet by 750 feet. Also in 2003, an additional 29 claims were acquired under lease to secure the potential northerly extension of the 144 Zone gold-bearing structure (Imperial Metals Corporation, 2005).

Generalized Geologic Description. The main mass of the Bare Mountains is composed of Paleozoic sedimentary rocks, which have been intruded by pegmatites and monzonite porphyry, while at the north end the hills are composed of flows of Tertiary rhyolite and basalt. Paleozoic sedimentary sequence includes schist, quartzites, and limestones that form a faulted monocline striking northwest and dipping northeast. They have been strongly disturbed by folding and faulting.

Mineral/Energy Occurrences. Precious metals occur in small, irregular quartz veins within dolomite. The veins are chiefly gold-bearing, although some contain silver. The minerals present include chalcopyrite, malachite, azurite, galena, pyrite, limonite, hematite, fluorite, and gypsum.

Mercury ore and opal also occur in dolomites and consist of masses of opal or of cryptocrystalline silica carrying cinnabar. Coarsely crystalline calcite and barite were noted with cinnabar in shattered dolomite in one instance.

The largest fluorspar deposit, the Daisy deposit, occurs about 4 miles southeast of Beatty. The deposit occurs in dolomite of the Nopah Formation in a structurally complex area with prominent northeast-trending, steep-dipping, right-lateral tear faults and gently northwest-dipping thrust faults. The shape and extent of the ore bodies appear to be controlled in large part by these two sets of faults, which more or less bound the bodies both vertically and laterally. The ore shoots are almost everywhere bounded by gouge zones of faults, and these impermeable zones apparently restricted the ore solutions to definite channels where the fractured dolomite was almost completely replaced by fluorite.

The ore at the Daisy deposit consists of fine-grained purple fluorite (CaF_2) with seams and layers of yellow clayey gouge. In the lower levels, the fluorite is partly to largely white or yellow and granular; calcite-filled fissures as much as 3 feet wide are common. Fine crystals of cinnabar are locally abundant, lining vugs in this calcite. The radioactivity of the deposit has been investigated and the equivalent uranium content was found to range from 0.002 to 0.015 percent (Cornwall and Kleinhampl, 1964). The ore mineral was probably deposited by ascending hydrothermal solutions that moved along permeable channels in the fractured Paleozoic rocks. The ore solutions probably moved up from a nearby chamber of Tertiary rhyolite magma that also erupted voluminous ash flows, tuffs, and fluidal flows in the area just north of the Daisy Mine (Cornwall, 1972).

The Beatty area, in proximity to and east of U.S. Highway 95, reportedly contains various industrial mineral deposits including clay, fluorspar, building stone, pumice, pumicite or cinder, silica, and zeolite, as indicated in NBMG Map 142.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a medium to high potential for conflicts between the NRL and the Bare Mountain Mining District based on the following:

1. The NRL traverses a known, recently active silica quarry (notice of intent).
2. Silica and clay are present and gold and silver mineralization is close to the NRL.
3. Recent gold mining by Glamis Gold Ltd. at the Daisy Mine is located within the Bare Mountain Mining District, and approximately 4 to 5 miles from the NRL.
4. Recent (2003) exploration and gold mining at the Sterling Property (Sterling Mine) by Imperial Metals Corp. located about 4 to 5 miles west of the NRL.
5. Reportedly active decorative rock operations in upper Beatty Wash, approximately 2 miles northwest of the Daisy Mine leach pad.
6. The Beatty area, close to and east of U.S. Highway 95, reportedly contains various industrial mineral deposits including clay, fluorspar, building stone, pumice, pumicite or cinder, silica, and zeolite, as indicated in NBMG Map 142.

6.4 Bullfrog (Rhyolite) Mining District (Plate ID No. 4)

Mining District or Area Name, Location, Map Reference Number. The Bullfrog Mining District, also known as the Rhyolite District, and referenced in this report as Map ID No. 4 (Plate

1), is located in the Bullfrog Hills in southern Nye County. It is west, southwest, and northwest of Beatty and extends from Bullfrog and Rhyolite on the south to Pioneer on the north. The highest point in the Bullfrog Hills has an elevation of 6,235 feet. The northern section of the Bullfrog District is sometimes considered as a separate district called the Pioneer District. A small area north of the Pioneer Mine area called Daisy Mountain is also included in the Bullfrog Mining District. The northeastern portion of the Bullfrog Mining District is approximately 1 mile from the NRL. The vast majority of historic mining activity had occurred more than 5 miles southeast of the NRL.

History of Discovery, Exploration, and Mining. Bullfrog was reportedly discovered by Frank ("Shorty") Harris in 1904, and a rush of prospectors into the new camp ensued. In 1905, the Las Vegas and Tonopah Railroad (LV&TRR) reached the district; and in 1907 the Beatty Goldfield Railroad (BGRR) and the T&TRR, then the LV&TRR, was extended to Goldfield. The Montgomery-Shoshone Mine was the most important in the district. This property was equipped with a 200-ton amalgamating, concentrating, and cyaniding mill, which began operations in 1907 and shut down in 1910. In 1911, the Mayflower Mine was operating a 15-stamp mill, and in 1912, the Tramp Mine was also running a mill. The Pioneer 10-stamp mill began operations late in 1913, and the Sunset 10-stamp mill was erected in 1914. The Pioneer mill shut down in 1917, and activities in the camp were at low ebb until 1921 when the mines in the Pioneer section resumed active development work (Lincoln, 1923).

The reported production of the Bullfrog District from 1905 to 1921 was 286,664 tons of ore containing 111,805.16 ounces of gold; 868,749 ounces of silver, 5,294 pounds of copper, and 11,897 pounds of lead, valued in all at $2,792,930 (Lincoln, 1923).

Based on information obtained from the Nevada Mineral Industry, 2003, the Providence Gold Project in the Bullfrog Mining District is being evaluated by Alberta Star Development, which has agreed to explore and develop JABA, Inc.'s property. The property reportedly consists of 45 unpatented and 2 patented claims and is located on the east edge of the Montgomery-Shoshone pit of the Barrick Bullfrog mine complex. Geologic and alteration mapping and detailed geochemistry suggests that the extension of the same gold mineralization present across the property boundary that forms the east wall of the open pit is present in strongly altered and closely veined tuff on the Providence property.

In addition to the information provided above, the 2003 *Nevada Mineral Industry* report also provided summaries of relatively recent reserves/resources and production information for three other properties/deposits in the Bullfrog Mining District, including the Montgomery Shoshone, Gold Bar and Bullfrog. The information is summarized below.

At the Montgomery Shoshone Property in the Bullfrog Mining District, the following information was obtained from the *Nevada Mineral Industry*, (2003) regarding ore reserves/resources and production history.

Deposit Name	Reserves/Resources	Production History
Montgomery Shoshone (Bullfrog District)	1988: 3.1 million ton, 0.072 opt Au, 0.240 opt Ag	(no data provided in reference)

At the Gold Bar Property in the Bullfrog Mining District, the following information was obtained from the *Nevada Mineral Industry*, (2003) regarding ore reserves/resources and production history.

Deposit Name	Reserves/Resources	Production History
Gold Bar (Bullfrog District)	1987: 1.23 million tons Au ore 1993: Idle	(no data provided in reference)

At the Bullfrog Property in the Bullfrog Mining District, the following information was obtained from the *Nevada Mineral Industry*, (2003) regarding ore reserves/resources and production history.

Deposit Name	Reserves/Resources	Production History
Bullfrog (Bullfrog District)	1987: 18.6 million tons, 0.097 opt Au 1996: 10.2 million tons, 0.062 opt Au proven and probable reserves; 3.7 million tons, 0.040 opt Au mineralized material	1989-89: 2,237,484 oz Au; 2,935,484 oz Ag 1999: 76,159 oz Au; 90.067 oz Ag

Generalized Geologic Description. The gold deposits occur in fissures and veins in rhyolitic-welded tuffs and are, for the most part, related to steep normal faults as described in detail by Ransome et al. (1910). Most of the deposits occur along the east rim of a postulated caldera. Several other deposits, including the original Bullfrog mine, occur along the north contact of the central domal uplift of basement rocks into the Tertiary pyroclastics (Cornwall, 1972).

As described by Ransome et al. (1910), the principal ore body of the district occurred in the Montgomery-Shoshone mine, near the surface, where numerous vertical fissures on the southeast side of the steeply dipping Montgomery-Shoshone fault intersected it from below. The two other most promising deposits in the district are at the Mayflower and Pioneer mines, 6 and 6.5 miles northwest of Beatty, respectively. The Mayflower deposit occurs along a fault or fissure that dips 60 to 65 degrees southwest. The Pioneer deposit is said to be identical to the adjoining Mayflower deposit. The rhyolitic host rocks (welded tuffs of the Timber Mountain and Paintbrush Tuffs) of these deposits are moderately to intensely altered. Most of the other gold-silver prospects in the Bullfrog Hills are similar to, but leaner than, those described above.

Mineral/Energy Occurrences. The mineralogy of the gold-silver veins is simple and consists of quartz, calcite, and finely disseminated gold-silver in scattered pyrite grains (plus small amounts of chalcocite, chrysocolla, and malachite in the original Bullfrog mine). Cerargyrite has been detected but is not abundant. The gold to silver ratio is reported to be 1:8, and the average grade was $10 per ton. Indications of radioactivity have been found at two of the gold-silver prospects, but no uranium production has been reported (Cornwall, 1972).

In addition to the precious metal deposits of the Bullfrog Mining District, a small bentonite deposit at the Vanderbuilt mine, 1.5 miles south of Beatty, was operated by the Silicates Corporation. Two bentonite bodies, 300 feet apart, occur along the footwall side of a fault that dips about 50 degrees west. The bentonite formed by intense hydrothermal alteration of welded and nonwelded rhyolite tuff. The high-grade ore is soft and white, and has waxy pink or tan spots that probably represent pumice fragments. Original phenocrysts of quartz, sanidine, oligoclase, and biotite are still visible in the bentonite. X-ray determinations indicate that the bentonitic clay is nearly pure montmorillonite (Cornwall, 1972).

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflicts between the NRL and the Bullfrog Mining District based on the following:

- Distance between the NRL and historically mined areas of the district.
- Generally small, narrow, localized areas (fissures and veins) of gold, silver and lesser copper mineralization.
- Apparent decrease in the strength of structures controlling mineralization toward the NRL.

- Silica resources associated with the recently operated David Spicer silica mine.
- Clay resources.
- Geothermal resources currently being utilized at Bailey's Hot Spring spa, just north of Beatty (direct use of geothermal resource).

6.5 Transvaal Mining District (Plate ID No. 5)

Mining District or Area Name, Location, Map Reference Number. The Transvaal Mining District, also known as the Nyopolis District and referenced in this report as Plate ID No. 5 (Plate 1), is located within and adjacent to the southwest boundary of the NTTR, north of Beatty Wash, about 15 miles northeast of Beatty, in southern Nye County. The southwestern portion of the Transvaal Mining District is less than 1 mile from the eastern NRL. This mining district was not accessed because we did not have permission to enter the NTTR.

History of Discovery, Exploration, and Mining. Transvaal reportedly was discovered in 1906, was only active for a few months, and has no recorded production. Upon discovery of occurrences of gold and mercury, a rapid, but short-lived boom that included the construction of a tent city occurred. The population quickly reached a maximum of 700 persons and two newspapers began, but by late May of the same year, the site was completely abandoned (Hall, 1981). Numerous adits, shafts, and prospects are present in the district. Little else is known regarding the early history of the district.

Generalized Geologic Description. Workings in the district are generally associated with faults and hydrothermally altered volcanic rocks near the margin of the Timber Mountain cladera, which formed during the eruption of the Ammonia Tanks Tuff (Byers et al., 1989; Nogle et al., 1991). The main part of the district is located east and southeast of the Transvaal site and is situated within intracaldera-facies ash-flow tuffs and landslide deposits of the Rainer Mesa Tuff, and overlying and outflow-facies of the Ammonia Tanks Tuff and tuff of Cutoff Road (Byers et al., 1976). A large area of acid-sulfate alteration characterized by porous, fine-grained mixtures of kaolinite, alunite, quartz, opal, and iron oxides +/- calcite +/- dolomite, and inferred to be of the steam-heated type, is centered about 1 mile east of the Transvaal site. This alteration assemblage grades abruptly westward into a large area of weak argillic alteration containing narrow zones of silicification and adularization along fault surfaces. In the northern part of the district, the area of argillic alteration is bordered by areas of zeolitic alteration within ash-flow units of the Timber Mountain Group. The zeolitic alteration is characterized by the presence of abundant thin veins and fracture coatings of coarsely crystalline stilbite and smaller amounts of water-clear alunite.

Mineral/Energy Occurrences. The principal workings of the district are located less than one mile southeast of the townsite and consist of a shaft estimated to be less than 300 feet deep, and a nearby adit. Most workings in the main and northern parts of the district are along steeply dipping, north- to northeast-striking normal faults, mainly within areas of argillic and zeolitic alteration. Innumerable shallow pits, cuts, and short adits are also associated with areas of distinctive, reddish-orange iron oxide staining common in tabular bodies of clast- and matrix-supported landslide breccia.

Results of geochemical data generated by Tingley et al. (1998) show that rocks that have undergone acid-sulfate alteration contained only weakly elevated concentrations of mercury, gold, and other elements. During this geochemical survey, no evidence of ores of any type was observed on the dumps of or within the shallow workings in the district. The geochemical data, together with the nature of the alteration exposed in the district, are consistent with that of a shallow, largely vapor-dominated portion of a epithermal-type hydrothermal system.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflict based on the following:

- Majority of the Transvaal Mining District lies within the NTTR.
- Small, narrow, localized areas of gold and copper mineralization.
- Apparent absence of reported production and no evidence of ore mineralization on the dumps of or within the shallow working of the district (Tingley et al., 1998).
- Decorative rock resources based on the presence of the apparently intermittently operating David Spicer quarry.
- Open File Report 98-1, *Mineral and Energy Resource Assessment of the Nellis Air Force Range,* (Tingley et al., 1998) reported a moderate potential, certainty level C for hot-springs-type mercury deposits for areas only within the NTTR, and a low potential, certainty level B, for shallow high-grade and bulk-mineable, epithermal precious-metal deposits.

6.6 Thirsty Canyon-Sleeping Butte Area and OV3 (Plate ID No. 6)

Mining District or Area Name, Location, Map Reference Number. The Thirsty Canyon – Sleeping Butte area is referenced in this report as Plate ID No. 6 (Plate 1) and is located within and adjacent to the southwest boundary of the NTTR, north of Beatty Wash, about 15 miles northeast of Beatty, in southern Nye County. The Thirsty Canyon – Sleeping Butte area is approximately 2 miles northeast of the eastern NRL. The Thirsty Canyon-Sleeping Butte area is traversed by the OV3 segment of the proposed NRL. A site visit to the portion of this mining district located within the NTTR was not performed, because we did not have permission to enter the NTTR.

History of Discovery, Exploration, and Mining. Information regarding the early history of the discovery, exploration, and mining of this area was not identified during this investigation.

Nevada Neanderthal Stone Co. was active in the area, mining building stone in blocks weighing up to 25 tons and hauling them to a shop in Beatty, which had a capacity to produce 2,000 square feet of floor tile per day (Castor, 1991). Nearly 100,000 square feet of tile was produced in 1993 (Castor, 1994).

Approximately 10 years ago, the boundary of the NTTR in this area was resurveyed and discovered to include the decorative stone quarry in Thirsty Canyon; therefore, the mining claims for the quarry were withdrawn (Spicer, personal communication, 2004).

Generalized Geologic Description. Regional geology for this area is discussed in Section 6.5.

Mineral/Energy Occurrences. Decorative rock and building stone has been quarried from Miocene-age ash-flow tuff and fragmental lithic tuffs.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflicts between the NRL and the Thirsty Canyon-Sleeping Butte Area based on the following:

- Majority of the Thirsty Canyon-Sleeping Butte Area lies within the NTTR.
- Distance between known mineral resources and the NRL (westernmost alignment).
- The OV3 proposed alternate alignment traverses a portion of the mining claims and oil and gas leases (Plate ID No. 7).
- Approximately 10 years ago, the boundary of the in this area was reportedly resurveyed and was discovered to include the decorative stone quarry in Thirsty Canyon, therefore the mining claims for the quarry were withdrawn.

- Open File Report 98-1, *Mineral and Energy Resource Assessment of the Nellis Air Force Range* (Tingley et al., 1998), reported a low potential, certainty level B for epithermal precious-metals deposits in the area.

6.7 Oil and Gas Leases North of Beatty and OV3 (Plate ID No. 7)

Mining District or Area Name, Location, Map Reference Number. The oil and gas leases north of Beatty are referenced in this report as Plate ID No. 7 (Plate 1) and include 14 sections located approximately 12 miles north of Beatty along the southwest flank of Pahute Mesa in Southern Nye County. The NRL traverses the southwest portion of the oil and gas lease block. A portion of the oil and gas leases are traversed by the OV3 segment of the proposed NRL

History of Discovery, Exploration, and Mining. Information regarding the early history of the discovery, exploration, and mining of this area was not identified during this investigation.

Generalized Geologic Description. Regional geology for this area is discussed in Section 6.5.

Mineral/Energy Occurrences. Information regarding the early history of the discovery, exploration, and mining of this area was not identified during this preliminary limited investigation.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflicts between the NRL and the oil and gas leases north of Beatty based on the following:

- Apparent absence of exploration activity associated with these leases, which reportedly have been "active" since the 1970s.
- The OV3 proposed alternate alignment traverses a portion of the oil and gas leases.

6.8 Geothermal Occurrences (Sarcobatus Valley) (Plate ID No. 8)

Mining District or Area Name, Location, Map Reference Number. Geothermal occurrences are located along U.S. Highway 95 in Sarcobatus Valley between the oil and gas leases near Thirsty Canyon and the Clarkdale Mining District. One warm spring and one hot well are located in this area and are referenced in this report as Plate ID No. 8 (Plate 1). The warm spring is approximately 1/2 mile northeast of the NRL, and the hot well is approximately 1/4 mile northeast of the NRL.

History of Discovery, Exploration, and Mining. Information regarding the early history of the discovery, exploration, and mining of this area was not identified during this investigation.

Generalized Geologic Description. Regional geology for this area is discussed in Section 6.5.

Mineral/Energy Occurrences. Isolated geothermal occurrences, warm springs and hot wells, have been identified in this area. Other mineral resources are not known.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a moderate potential for conflicts between the NRL and the geothermal occurrences in this area based on the following:

- Apparent proximity of the NRL to the identified geothermal occurrences in the area (at the map scale used for this investigation, both occurrences plot at or within about 1/8 mile of the NRL).

6.9 Clarkdale Mining District (Includes Tolicha) (Plate ID No. 9)

Mining District or Area Name, Location, Map Reference Number. The Clarkdale Mining District, referenced in this report as Plate ID No. 9 (Plate 1), is included with the Tolicha Mining District for this report. The Clarkdale Mining District is located approximately 4 miles west of the Tolicha District, which is located about 3 miles east of Monte Cristo Spring, and includes the area between Tolicha Peak and Quartz Mountain. Other names for the district include Monte Cristo, Quartz Mountain Vignola's, and Carr's Camp. The southwestern portion of the Clarkdale Mining District is approximately 1/2 mile east-northeast of the easternmost NRL. Approximately 2/3s of the Clarkdale Mining District is within the NTTR and the majority of the precious metal occurrences are located within the NTTR. The Tolicha Mining District is located entirely within the NTTR. The portion of this mining district located within the NTTR was not accessed because we did not have permission to enter the NTTR.

History of Discovery, Exploration, and Mining. Initial prospecting reportedly began in the Quartz Mountain area around 1905, but the first significant discovery reportedly was in 1917, when rich gold ore was found on the Landmark-Life Preserver claims. Lessees were said to have shipped gold-silver ore valued at $750,000 from these claims in the early 1930s. The workings on the claims consist of several shafts, adits, and drifts totaling about 2,500 feet in length.

Exploration was also carried out 3 miles southeast of these claims along a 2-foot quartz vein in rhyolite, but apparently no ore was produced (Tingley et al., 1998).

In the Clarkdale area west of Tolicha Peak, gold was discovered in about 1933 and ore valued at $1,000 was shipped in that year. Two other groups of claims were explored in the 1930s about 1 mile west of the Clarkdale prospects.

Generalized Geologic Description. The Clarkdale and Tolicha Districts lie along the western edge of Pahute Mesa, a broad, elevated, nearly flat plateau covered by flat-lying ash-flow tuffs of the Timber Mountain and Thirsty Canyon Tuffs. These units are believed to be part of distal portions of a caldera associated with the voluminous volcanic package forming Pahute Mesa. The Clarkdale Mine workings are situated within areas of these tuffs and intrusive bodies of porphyritic rhyolite and rhyolite breccia that has been kaolinized or silicified (Tingley et al., 1998).

Mineral/Energy Occurrences. Ore in the Quartz Mountain area was found in brecciated zones cemented by quartz along a shear zone in silicified rhyolite flows. Ore in the Clarkdale area was found in a brecciated shear zone cemented by quartz in fluidal rhyolite. Most veins in the altered rhyolite that were stained with limonite carried gold and a little silver (Lincoln, 1923).

As part of the mineral assessment for NBMG Open File Report 98-1, rock samples were collected in 1994 to investigate the nature and extent of the hydrothermally altered and mineralized rocks in the district. The samples included dump-grab and rock-chip samples. The results of the analysis indicated ore-grade amounts of gold from select dump-grab samples and anomalous amounts of arsenic, antimony, thallium, beryllium, copper, lead, zinc, molybdenum, and mercury (Tingley and other, 1998).

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low to medium potential for conflicts between the NRL and the Clarkdale/Tolicha Mining District based on the following:

- Approximately 2/3s of the Clarkdale Mining District and the entire Tolicha Mining District is within the NTTR.
- Distance between the NRL and known historically mined areas of the district.
- Generally discontinuous, relatively narrow, brecciated shear zones containing some gold and silver mineralization.

- Presence of a relatively large gravel pit actively mined, located within or close to the NRL (similar gravel pits continue northward to the southern extent of the Cuprite Mining District).
- Open File Report 98-1, Mineral and Energy Resource Assessment of the Nellis Air Force Range (Tingley et al., 1998) reported a high potential, certainty level C, for small-tonnage, bonanza-vein, gold-silver deposits for areas within the NTTR, and a moderate potential, certainty level B, for bulk-mineable gold-silver deposits in altered favorable lithologic units (medium).

6.10 Scotty's Junction Area

Mining District or Area Name, Location, Map Reference Number. The Scotty's Junction area as referred to in Open File Report 98-1 (Tingley et al., 1998) is about a 2-square-mile area in the western escarpment of Pahute Mesa, along the eastern edge of Sarcobatus Flat. The area also includes scattered outcrops of hydrothermally altered rocks exposed about 3.5 miles east of Scotty's Junction, and is referenced in this report as Plate ID No. 10 (Plate 1). The Scotty's Junction area, as referred to in Open File Report 98-1, lies entirely within the NTTR and is located at its closest point, approximately 2 miles east of the NRL. Areas visited during the field reconnaissance were located west of the NTTR and the Scotty's Junction area, along U.S. Highway 95. This area is not a mining district defined by Tingley (NBMG, Report 47) or in the Mineral Resources of Southern Nye County, NBMG, Bulletin 77).

History of Discovery, Exploration, and Mining. Mine workings are not present, but reportedly there are some surface-dozed areas, trenches, possibly dating to the 1940s (Tingley et al., 1998).

Generalized Geologic Description. Rocks exposed in this area include a thick sequence of hydrothermally altered, thinly interbedded, initially glassy, nonwelded, ash-flow tuff and pyroclastic surge deposits. Assigned to the Tolicha Peak Tuff by Minor et al. (1993), the altered rocks are composed of mixtures of adularia, calcite, fine-grained silica, zeolite, and illite-smectite, and are cut by numerous thin veins of chalcedony and very fine-grained quartz. The style and mineralogy of the alteration is consistent with a shallow or distal part of an epithermal-type system (Tingley et al., 1998).

Mineral/Energy Occurrences. Analysis of surface rock samples collected in 1994 showed that calcite veins and hydrothermal breccia in the area contained elevated concentrations of gallium, mercury, molybdenum, antimony, and tungsten (Tingley et al., 1998). The veins and bodies of breccia are cemented by mixtures of ferruginous calcite, iron oxides, and silica. Calcite fills pores in the groundmass as well as lithophysal cavities of the ash-flow tuffs (Tingley et al., 1998).

Based on field observations during the field investigation, moving north from the Tolicha Wash gravel pit, progressively older gravel pits occur along U.S. Highway 95 in the Scotty Junction Valley area, north to the northern end of the valley and south approximately 5 miles from the Wagner Mining District.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low to medium potential for conflicts between the NRL and the Scotty's Junction Area based on the following:

- Scotty's Junction area lies both within the NTTR (Tingley et al., 1998) and outside the NTTR in areas of private property (farming, ranching, water wells).
- No known ore grade mineralization, only hydrothermal alteration and calcite veins reportedly containing anomalous concentrations of gallium, mercury, molybdenum, antimony, and tungsten.
- Presence of possible sand and gravel occurrences/resources and water wells.
- Open File Report 98-1, Mineral and Energy Resource Assessment of the Nellis Air Force Range (Tingley et al., 1998) reported a low potential, certainty level B, for bulk-mineable gold-silver deposits in altered favorable lithologic units within the NTTR. These favorable units or zones of alteration do not appear to extend into the NRL.

6.11 Wagner Mining District and BC2 (Plate ID No. 11)

Mining District or Area Name, Location, Map Reference Number. The Wagner Mining District is referenced in this report as Plate ID No. 11 (Plate 1). Most of the claims in the district lie just to the west of the, NTTR, but a portion of patented claims straddle the boundary (Tingley et al., 1998). The western boundary of the Wagner Mining District is approximately ¼ to ½ mile east of the two western NRL alignments. The easternmost proposed alternate alignment, BC2, located just west of the NTTR, is approximately 1 to 2 miles east of the easternmost boundary of the Wagner Mining District. The majority of historic mining activity is in an area between the two western and the easternmost alignment and the eastern alignment is 2 to 3 miles east of the majority of historic mine workings.

History of Discovery, Exploration, and Mining. The 18 claims of the Wagner (Ish) Group were located in 1903 and 1904 by Frank M. Ish of Goldfield, who had sunk two 100-foot shafts on the property by October 1906. Ore material from one of the shafts was said to assay 10 to 13 percent copper and $5 to $8 in gold, and material found during assessment work on the Ish group ran 20 percent copper and $15 in gold. There were plans to ship ore from the property in 1906, but there is no record of any production at that time. The Wingfield interests sank the main shaft 453 feet deep as well as a circular shaft 100 feet deep about a year or so prior to 1912, the year in which the claims were patented under the ownership of the Wagner Copper Co. (Lincoln, 1923).

The property was drilled by Gulf Resources and subsequently by BHP in the early 1990s. Reportedly some of the holes were as deep as 425 meters drilled in a search for a buried porphyry copper system. Apparently, no igneous porphyry was found in the deep holes drilled by BHP, but their drilling may not have been deep enough or were in the wrong locality (Tingley et al., 1998). Results of these drilling programs were not provided in the documents reviewed for this report.

Generalized Geologic Description. The main rock type in the mining district is the Wood Canyon Formation of Late Proterozoic and Early Cambrian age. The Wood Canyon Formation in the area consists of a thick sequence of shale, quartzite, and some intercalated limestone. The Wood Canyon Formation is intruded by an andesite plug and is unconformably overlain by silicic tuffs (Tingley et al., 1998).

Mineral/Energy Occurrences. Mineralization in the district is confined to the Wood Canyon Formation; the Tertiary volcanic rocks are unaltered. The mineralization occurs in brecciated quartzite; in silicified, brecciated shale; and in one locality, in kaolinized shale. Typical ores consisted of hematite-stained, brecciated quartzite cemented with clear, crystalline quartz, malachite, chrysocolla, and azurite. Recent sample analysis (Tingley et al., 1998) showed anomalous amounts of arsenic, bismuth, nickel, cadmium, mercury, antimony, zinc, cobalt, molybdenum, selenium, tellurium, uranium, tungsten, vanadium, tin, thallium, and barium in various samples.

The anomalous suite of elements of recent samples collected as part of preparing Open File Report 98-1 and the character of the mineralization (stockwork veinlets, silicified breccias in shales, quartzite, and minor carbonate replacement) characterize the Wagner Mining District as a polymetallic replacement deposit, possibly related to a buried copper porphyry (Tingley et al., 1998).

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a medium potential for conflicts between the NRL and the Wagner Mining District based on the following:

- Relatively recent exploration efforts (drilling and trenching) in the area by several exploration companies, including Gulf Resources/BHP.
- The district is close to the NRL.
- Open File Report 98-1, *Mineral and Energy Resource Assessment of the Nellis Air Force Range (*Tingley et al., 1998) reported a high mineral resource potential, certainty level C, for the occurrence of a limited tonnage of mixed oxide and sulfide copper ore and moderate resource potential, certainty level B for the occurrence of a buried porphyry copper deposit. Low mineral resource potential, certainty level C, is assigned to that portion of the NTTR adjoining the Wagner District.

6.12 Stonewall Mining District (Plate ID No. 12)

Mining District or Area Name, Location, Map Reference Number. The Stonewall Mining District is located on the north slope of Stonewall Mountain about 15 miles southeast of Goldfield and is referenced in this report as Plate ID No. 12. The district is adjacent to the western boundary of NTTR, at the northwest periphery of Pahute Mesa. The easternmost portion of the district, in the vicinity of Stonewall Spring, straddles the NTTR boundary. The NRL traverses the westernmost portion of the Stonewall Mining District. The majority of historic mining activity is in an area located approximately 3 miles east of the NRL.

History of Discovery, Exploration, and Mining. The Stonewall Mining District reportedly was prospected for gold and silver as early as 1905, and small shipments were made in 1911 and 1915 (Lincoln, 1923). Gold values ranged from a trace to $6 per ton. Kral (1951) reports that the Sterlog claims at the northwest corner of the Stonewall Mountain have a 240-foot shaft on a vein with silver mineralization and a 1-mile long adit driven south from Stonewall Flat to intersect the vein 500 feet below the collar of the shaft. The adit was driven in the 1920s and the property was abandoned shortly after.

NBMG files included a field examination sheet dated 1982 in which Jack Quade visited the Stonewall Silver Mine and indicated that Stonewall Silver mines was currently conducting extensive drilling up the northwest side of Stonewall Mountain and had exposed five or six benches and new roads and a mill site at the apex of the canyon (Quade, 1982). This area is approximately 1/2 mile south of the Stonewall Mine and the mineralizing vein structure. The area was not visited during field reconnaissance.

According to the Seabridge Gold, Inc. news release dated March 10, 2003, the Stonewall project includes 73 claims and covers the northern flank of the Stonewall mountains, approximately 15 miles southeast of Goldfield, Nevada. During the early 1900s, the Stonewall Mining District witnessed significant precious metals production from high-grade veins, which remain untested by modern exploration. Reportedly, the current exploration focus at Stonewall is on a series of generally parallel quartz veins occupying concentric ring fractures of a resurgent Tertiary caldera. These veins range from 1 to more than 60 feet in thickness with strike lengths of up to 8,000 feet. Textural evidence suggests these veins could represent the upper levels of an epithermal bonanza deposit (Seabridge Gold, Inc., 2003).

Generalized Geologic Description. According to Cornwall et al. (1972), Stonewall Mountain consists of steeply dipping rhyolitic and latitic welded tuffs intruded by quartz latite, bounded on the east by glassy rhyolite flows and plugs. Two blocks of Precambrian rocks border the intrusive quartz latite at the north end of the mountain. The welded tuffs have not been recognized outside of the mountain area. They may be concealed by younger rocks and alluvium that surrounded the mountain, or they may have been erupted into a volcano-tectonic graben and thus confined to that area.

The north end of Stonewall Mountain is bounded by a steep northward-dipping normal fault with downward movement on the north side. The eastern part of the district, in the vicinity of Stonewall Spring, is underlain largely by intracaldera welded rhyolite ash-flow tuffs and silicic resurgent intrusions, which have been hydrothermally altered to propylitic mineral assemblages including quartz, adularia, albite, chlorite, illite, epidote, pyrite, and calcite.

Mineral/Energy Occurrences. An east-northeast-striking, north-dipping system of quartz veins extends for about 5 miles along splays of the prominent range-bounding fault. The veins are as much as 15 feet wide and consist of banded, crustiform and drusy-comb quartz with locally abundant boxwork texture after bladed and tabular calcite. Much of the vein system comprises zones of up to about 45 feet in width of closely spaced, anastomosing and subparallel veins and cockade-crustified breccia. Fragments of banded quartz overgrown by later stages of quartz are common, indicating repeated episodes of brecciation and fracturing occurred during vein emplacement. Wall rocks are strongly adularized, silicified, and pyritized for several meters away from the vein margins. The veins are thoroughly oxidized in surface exposures (Cornwall et al., 1972).

Recent chemical data (Tingley et al., 1998) from surface rock-chip samples indicate the veins contain highly elevated, but sub-economic quantities of gold and silver. Concentrations of base metals and the indicator elements arsenic, antimony, mercury, tellurium, and thallium are low, even in samples containing abundant silver. Tin and selenium are low, and elevated amounts of bismuth and molybdenum are present locally.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflicts between the NRL and the Stonewall Mining District based on the following:

- Distance between the NRL and the currently identified areas of mineralization.
- Bonanza-type vein deposits containing gold and silver mineralization in quartz is prominent at the historically mined areas and continuing easterly, away from the NRL.
- Structures controlling gold and silver mineralization appear to weaken westerly, in the direction of the NRL based on field reconnaissance.
- Relatively recent mineral exploration activity by Seabridge Gold, Inc. in the area.
- Open File Report 98-1, *Mineral and Energy Resource Assessment of the Nellis Air Force Range* (Tingley et al., 1998) reported a high potential, certainty level C, for small-tonnage, bonanza-vein, epithermal gold-silver deposits, at depth, for areas adjacent to the NTTR, and a moderate potential, certainty level B, for stockwork-disseminated, gold-silver deposits, at depth near the vein system.

6.13 Cuprite Mining District (Plate ID No. 13)

Mining District or Area Name, Location, Map Reference Number. The Cuprite Mining District is located along Mount Jackson Ridge, about 12 to 15 miles south of Goldfield in Esmeralda County, and is referenced in this report as Plate ID No. 3 (Plate 2). The easternmost portion of this mining district lies approximately 1/4 mile west of the NRL.

History of Discovery, Exploration, and Mining. The copper ores that gave the Cuprite Mining District its name were discovered in 1905. Small amounts of these ores and of lead-silver ores have reportedly been shipped. A few shipments of sulphur were made prior to 1909, and a considerable number since (Lincoln, 1923).

At the northeastern portion of the Cuprite Mining District, west of U.S. Highway 95, the field reconnaissance indicated evidence of recent mining claims (wooden posts) as well as recent trenching and drilling. There is a geothermal well in the area. The pad has been reclaimed and this drilling appears to pre-date the precious metals exploration efforts.

There is also a silica quarry (Appendix, M2-2-FD1), within the mining district. The identity of the owner of this property was not determined in the course of these studies. Geothermal wells are recorded in the area, east of U.S. Highway 95. An abandoned well in this area and numerous roads were observed and appear to be associated with geothermal exploration. NBMG Map 141 also indicates the presence of numerous warm and hot heat flow wells in this area.

Generalized Geologic Description. According to Ball (1907), chalcopyrite and lesser pyrite, galena, calcite, and quartz appear to have been deposited as sporadic masses in the limestone as seams along joints and as lens-shaped bodies along shear zones. The ores were altered by aqueous solutions to chalcocite, carbonates, and oxides. The limestone is apparently in part of the Mule Spring Limestone (Lower Cambrian) and the Emigrant Formation (Middle and Upper Cambrian).

Gold-bearing veins in Tertiary rhyolite occur in northeast end of the district. Sulphur occurs in altered Tertiary tuffaceous sedimentary rocks and welded tuffs at the northeastern end of the district. Production from the district is apparently very small, and none has been recorded (Ball, 1907).

Mineral/Energy Occurrences. The mineral deposits of the Cuprite Mining District are copper-silver-gold replacements in the Cambrian limestone and gold-bearing veins in Tertiary rhyolite. The minerals of the replacement deposits are chalcopyrite, pyrite, galena, calcite, and quartz.

Deposits of silica, sulphur, and potash have been identified (Ransome, 1909). One large deposit is located on top of a small hill of Siebert Conglomerate and is a nearly horizontal stratum of white ashy material containing masses of sulphur. This white material was probably originally rhyolite tuff or glass, but is now altered to silica and alunite. A second deposit is located approximately 1/2 mile northeast of Cuprite and consists of altered rhyolite pumice containing alunite. Most of the silica is low alunite, and the alunite is a soda variety low in potash (Lincoln, 1923).

Background data reviewed and results of the field reconnaissance suggest the presence of a relatively large geothermal system in this area.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a medium to high potential for conflicts between the NRL and the Cuprite Mining District based on the following:

- The NRL is close to historically mined and recently identified areas of mineralization in the district.
- Structures or favorable rock types controlling mineralization in the area of the historic mine workings appear to continue into the general area of the NRL.
- Relatively recent production of silica from a quarry located approximately 1/10 mile west of the NRL.
- Presence of a relatively large geothermal system and evidence of previous geothermal exploration efforts.
- Evidence of recent exploration activity, as evidenced by mining claims and drilling.
- Copper, silver, gold, sulfur, clay, silica, and geothermal resources have been identified in the area close to the NRL.

6.14 Goldfield Mining District (including Goldfield Main, McMahon Ridge, and Gemfield) and GF4 (Plate ID No. 14)

Mining District or Area Name, Location, Map Reference Number. The Goldfield Mining District is located in the Goldfield Hills in eastern Esmeralda County and western Nye County, near the town of Goldfield, and is referenced in this report as Plate ID No. 14. The mining district includes three areas commonly referred to as the Goldfield Main, McMahon Ridge, and Gemfield. In addition, an area referred to as the Tom Keane area is also the subject of recent, (2003) exploration efforts. The eastern portion of the district lies within the .NTTR.

An initial field reconnaissance was conducted in June and July 2004 to evaluate the general area of the initial Caliente Rail Corridor alignments (GF1/GF5) in the Goldfield Mining District area. Both of these initial alignments traversed portions of the Goldfield Mining District. In April 2005, a subsequent field reconnaissance was conducted along a proposed alternate alignment designated as GF4 (Plate 1). This subsequent proposed alignment crosses U.S. Highway 95, from east to west, approximately 5 to 6 miles north of the town of Goldfield, then continues south, paralleling the highway for approximately 6 to 7 miles. This portion of the alignment is generally located about one mile west of U.S. Highway 95, between the Gemfield area and the highway. South of the Gemfield area, the alignment then traverses the foot of Malpais Mesa near a public cemetery, natural springs, and the western portion of historic structures in the town of Goldfield. Proposed alternate alignment GF4 again crosses, from west to east, U.S. Highway 95, approximately 1 mile south of Goldfield, and continues east approximately 3 miles, then south-southeast for approximately 4 miles

History of Discovery, Exploration, and Mining. The Goldfield Mining District was discovered by Harry Stimler and William Marsh on December 2, 1902. After a brief period of excitement, most of the prospectors left the camp and the original claims were allowed to lapse. A.D. Meyers and R.C. Hart located the Combination Lode on May 24, 1903. Ore was discovered on that claim the following October, shipments began in December, and the great Goldfield stampede ensued. The railroad was extended to Goldfield in 1905, at which time the population of the town was 8,000. The Goldfield Consolidated. Mines Company (GCMC) the principal company in the camp, was organized by George Wingfield and George Stuart Nixon in 1906, and its 100-stamp mill was completed in 1908. In 1908, the town of Goldfield reached its maximum population of 20,000. From 1904 to 1918, the Goldfield Mining District was the most important gold-producing district in Nevada. By that time, the large known orebodies had become nearly exhausted and the production fell off rapidly (Lincoln, 1923).

The GCMC closed in December 1918, and some minor production continued during the 1920s, primarily by leaseholders. The Bradshaw Company's work of reprocessing the GCMC mill tailing was the majority of activity in the Goldfield Mining District during the 1930s. Newmont discovered and mined the Newmont lode in the Goldfield Main portion of the mining district during the late 1940s and so far as it is known only sporadic small scale prospecting activity occurred in the 1950s. Several companies explored the Goldfield Mining District for copper-molybdenum deposits during the 1960s. Since 1970, the Goldfield Mining District has been the focus of numerous exploration ventures for gold, mainly due to the deregulation of the gold price (MVGI, 2005).

American Resources Corporation and its predecessors extracted a significant tonnage of heap leach ore from the Combination, Red Top, and Jumbo open pit mines from 1988 through 1995, but production figures are uncertain. North Mining leased the exploration rights for the property in 1996, and conducted exploration activities on the property through 1998. Rea Gold

Corporation acquired American Resources Corporation, but declared bankruptcy in 1998. Decommissioning Services LLV of Reno, Nevada, acquired the property interests and reclamation responsibilities of Rea Gold. Romarco Goldfield, a wholly owned subsidiary of Romarco Minerals, Inc., obtained a mining sublease, lease, and option to purchase agreement for the Decommissioning Services LLC, properties in 1999 and conducted exploration activities on the property until the company purchased the U.S. interests of Romarco Goldfield (now Metallic Goldfield) from Romarco Minerals, Inc. in April 2001. Metallic Ventures Gold, Inc. (MVGI), has been actively exploring for gold throughout the Goldfield Mining District since that time, but drilling efforts have been focused mainly in the Gemfield and McMahon Ridge areas (MVGI, 2005).

Based on information obtained from MVGI, district-wide exploration efforts in the Goldfield Mining District in the past was limited to a large degree by the fragmented character of the land ownership. Consolidation of mineral rights by MVGI, has recently provided MVGI with access to a larger portion of the entire district, resulting in a much more comprehensive understanding of the geology and exploration potential of the Goldfield Mining District (MVGI, 2005).

Since its discovery in 1902, more than 4.2 million ounces of gold, 1.5 million ounces of silver, and 7.7 million pounds of copper has been produced from the Goldfield Mining District (Ashley and Keith, 1976). Only sporadic minor production has come from the district since the 1920s (MVGI, 2005).

According to interviews conducted as part of the June and July 2004 investigative efforts, MVGI has been and currently is active in the area. They are/were in the process of consolidating land and mineral resource ownership and are conducting exploration activities that have reportedly defined economic gold mineralization in several separate areas within the district, including McMahon Ridge, Gemfield, and Goldfield Main.

The following information regarding previous mineral exploration activities was obtained from the Metallic Ventures, Inc. website (MVGI, 2004, 2005).

- Extensive work has been done by the USGS on the distribution of gold and other ore-related elements in the altered rocks at Goldfield. Samples collected from the January and Combination mines analyzed semi-quantitatively show that gold, silver, lead, bismuth, mercury and arsenic are notably enriched. All these elements except lead and mercury form ore minerals. Nearly all of these elements are confined to silicified rocks and do not extend into adjacent clay-altered rocks.

- Identification of certain minerals in ore samples has been directly related to gold mineralization. Drill hole and surface geochemical assays also indicate these elements that are directly associated with gold mineralization in structural zones throughout the district.
- Numerous gold-bearing, mineralized zones have been identified using surface sample geochemistry; the most important of these are located within 12 highly prospective target areas. These 12 target areas occur within 5 major structural zones. The target areas include those with historical production, as well as others that have little or no previous gold production, but exhibit certain geological characteristics that indicate a high level of mineral exploration potential. Target areas with significant historical production include the Goldfield Main Area, McMahon Ridge Area, Sandstorm-Kendall mine, Vernal-Belmont mine, and the Adams mine. Other targets that are also believed to have a high level of exploration potential include the Gemfields Area, C.O.D. Ridge, Excelsior mine, Columbia Mountain fault, Red Hills, Preble Mountain, and the Tom Keane mine.
- Based on the results of surface geochemical exploration, two main geochemical regions have been identified in the greater Goldfield Mining District. A strong northeast-oriented line of geochemical separation exists between these two regions and is visible in geochemical plots. The location of the line separating the two geochemical regions correlates very well with the east edge of a northeast-trending structural zone.
- All of the major producing mines in the Goldfield Mining District are found on the northwest side of the line of geochemical separation. In this region, gold mineralization closely follows the ring fracture system, becoming strongest where cross-faults are present.
- Numerous geophysical surveys have been conducted throughout the Goldfield Mining District for many years, particularly since 1980. Romarco Goldfield and MVGI are aware of, and actually have datasets for a number of these surveys, but only partial reviews of these results have been made by Romarco Goldfield or Metallic Ventures Gold, Inc. to date.
- Various geophysical (induced polarization-resistivity) surveys conducted in the Goldfield Mining District over the years have tended to outline zones of silicification without the distinction as to the character of copper-gold mineralization. Most of the induced polarization work completed to date has indicated silica ledges to depths of more than 200 feet by measuring resistivity.

The following information regarding the mineral exploration programs, results of previous drilling programs, data integrity, mineral resource estimates, and planned future exploration programs and engineering studies was obtained from the Metallic Ventures, Inc. website (MVGI, 2004 and 2005).

- The drill hole database of the Goldfield property contains a total of 1,745 drill holes totaling 627,860 feet of drilling of both reverse circulation and core drilling. Most of the holes are reverse circulation and were drilled between 1980 and 1994. Drill hole data are summarized below:
  - Goldfield Main area – 990 drill holes representing 267,826 feet of drilling.
  - McMahon Ridge area – 152 drill holes representing 56,023 feet of drilling.
  - Gemfield area – 65 drill holes totaling 99,553 feet of drilling
  - Recent exploration activities in the area have been focused on three areas, McMahon Ridge, Gemfield, and Goldfield Main. Romarco/Goldfield began drilling in 1999 and has continued through the present as MVGI, though not continuously.
- Most of the drilling at the Gemfield area was completed by Kennecott Exploration Company in the early 1990s. A total of 156 reverse circulation drill holes totaling 94,950.6 feet and nine core holes totaling 4,602.5 feet were completed in the deposit. Mineral Resource Development, Inc. (MRDI), an independent consultant, performed resource modeling and reserve estimation. The Gemfield area was evaluated as an open pit mine by Kennecott Exploration Company, but later was explored by Franco-Nevada for the high grade potential. The program was successful, having drilled 122.5 feet grading 0.326 ounces of gold per ton. MVGI plans to concentrate on delineating the high-grade material.
- At the McMahon Ridge area, there has been a significant amount of drilling. This area is currently under recommendation for a thorough resource study to fully evaluate and understand the high-grade zone. Following resource estimation, an economic scoping study, which assesses both open pit and underground mining potential, will then be completed.
- Little is known about the sample preparation, assaying, quality control, and security of the drilling conducted between 1970 and 1995. Because of this, detailed sample integrity and sample result comparisons were made between Romarco/Metallic drill data and previous earlier drilling.
- The Goldfield Main area contains known resources and has the potential to expand the defined sources but also has some potential problems with the underlying data that defines these resources. The recommended plan for work will include validating the existing data, making a metallurgical model, and then optimizing a pit. A preliminary scoping study may also be done to define how much effort and cost should be incurred on development of the Goldfield Main area.
- The open pit mines in the Goldfield Main area during the early 1990s had problems reconciling tons and grade to any model used to predict production. This could have been due to a number of factors, including (1) problems with the underlying data, (2) problems with the model estimation, (3) assay problems in the company lab, (4) blasthole pattern and poor grade control, (5) stope definitions, (6) tonnage factors, or (7) excessive mining dilution/ore loss.

- Regarding mineral resource estimates, the Goldfield Main area deposit has been mined by underground and, more recently, open-pit methods. The historic production was from thick (100 feet), shallow-dipping zones and from a number of relatively narrow high-angle structures. This historic production, though emphatically showing the presence of gold, has caused problems in estimating resources because of the presence of backfilled underground workings. There were indications that during surface mining, more backfill stope material was encountered than had been anticipated; however, backfill stope material is often mineralized and does not represent a complete loss of resource. The lack of diamond drilling in the district makes the detailed structural interpretation difficult, just as it makes the stope fill material difficult to define. In addition, there is a marked lack of check sampling for the various drill campaigns.
- Regarding mineral resource estimates, the McMahon Ridge Area mineralization is continuous, reasonably predictable at low grades, and open-ended. Though the presently defined resource is small, the model is conservative in volume, and ongoing drilling will expand the defined size. The high-grade zones are difficult to predict. The deposit lends itself to open-pit mining as the continuity and controls of the high grade are unknown. The lack of well-defined geology makes it difficult to evaluate the integrity of the samples.
- In summary, according to the available information, MVGI reports indicated inferred and indicated resources for the Goldfield Property as follows:

Classification	Cutoff (ounces/ton)	Tons (000's)	Grade/Gold (ton)	Ounces gold (000's)
Indicated	0.010	23,410.2	0.031	720.3
Inferred	0.010	10,239.1	0.024	247.0

- Regarding future exploration and development, in total, MVGI was planning to spend approximately $1,200,000 on the Goldfield property project in 2003. The planned program is broken down into three main areas: McMahon Ridge, Gemfield, and Goldfield Main. The focus of these programs is to explore still untested targets, expand unknown resources, and to better define the resources and their potential mineability. It must be noted that the amount of ground controlled by MVGI and potential areas of mineralization indicate that the budget here defined is only the beginning of the planned exploration and development project.

The following information was obtained from the MVGI Renewal Annual Information Form (MVGI, 2005b) for the year ended December 31, 2005, dated March, 2005. The Goldfield Project consists of 385 patented and 849 unpatented claims covering more than 20,600 acres in Esmeralda and Nye Counties. Based on information provided in the 2005 summary, the Goldfield Project land holdings are very large and very complex in terms of location, ownership, and spatial relationship of patented and unpatented mining claims. Existing gold resources are contained in three areas on the Goldfield property; the Goldfield Main deposit, located immediately northeast of the town site, the Gemfield deposit located 1.5 miles north of town, and the McMahon Ridge deposit located approximately 2.5 miles northeast of Goldfield. Reportedly, the Goldfield Project is in the exploration stage and definitive economic studies have not been completed.

MVGI reportedly completed a considerable amount of pre-feasibility work in 2004. The scope of work reportedly included metallurgical testing, detailed deposit modeling, environmental studies, permitting and development drilling. Comprehensive metallurgical tests were completed on samples of diamond drill core from six holes representing the Gemfield deposits and four holes from the McMahon Ridge deposit.

The 2004 exploration program generally included the following as obtained from the MVGI, March 2005, Renewal Annual Information Form for the year ending December 31, 2004. As the first part of the drilling program, MVGI completed 47,070 feet of reverse circulation drilling in thee key areas of the Goldfield property during 2004. A total of 22,460 feet of drilling was completed in 39 holes in the Adams mine area, which is situated approximately halfway between the McMahon Ridge and Gemfield gold deposits and is considered a favorable site for an ore processing facility. The 2004 Adams mine drilling program was a continuation of the evaluation process for the locations of haul roads, plant sites, and heap leach pads initiated during the 2003.

The second part of the 2004 drill campaign consisted of 11,820 feet of reverse circulation drilling in 25 infill holes completed within the McMahon Ridge deposit. Additional drilling increased MVGI's confidence in the geologic model and the results provided a better understanding of gold distribution in the core area of the deposit, where the majority of contained ounces of gold the resource is known to occur.

Part three of the 2004 drilling program was exploration oriented and amounted to 12,790 feet of drilling in 12 holes completed in the historic Jumbo Extension mining area of the Goldfield Main District.

The 2004 Goldfield drilling program was completed by the end of March. If the results of the NI 43-101 report for the Gemfield and McMahon Ridge areas are positive, MVGI plans to conduct additional metallurgical tests, step out drilling for open pit design and waste dump site condemnation in 2005 They also plan to conduct in house economic scoping studies in 2005, in advance of a feasibility study (MVGI, 2005).

In their March 2005 report, MVGI provided the same table showing inferred and indicated resources as they provided in 2002 (previous table in this section). However, MVGI that a significant amount of new data had been added to the drill hole database since these estimates were compiled, particularly in reference to the Gemfield and McMahon Ridge gold deposits.

The following are factors affecting previous mineral resource estimates provided in 2002 (MVGI, 2005):

- **Gemfield Deposit**: As indicated by MVGI, the 2002 mineral resource estimates for the Gemfield Deposit is based upon a grid of vertical holes spaced approximately 100 feet apart. The majority of these holes are directed at a gently dipping, tabular ore deposit. The drill hole database in 2002 consisted of approximately 170 holes and the drill hole population in the east and northeast part of the deposit was particularly sparse. MVGI completed an additional 221 infill holes within the limits of the original resource area. The additional drill hole results have been added to the Gemfield drill hole database and geologic model, and a revised resource estimate is expected to be reported in a forthcoming NI43-101 report (MVGI, 2005).
- **McMahon Ridge Deposit:** As indicated by MVGI, mineralization in the McMahon Ridge Deposit is continuous and reasonably predictable. The deposit lends itself to open pit mining of near surface mineralization, and underground mining of high-grade gold shoots at depth. In 2002, MDA pointed out that there might be some downhole contamination in the holes previously completed by previous investigators. MVGI completed considerable drilling since 2002 and also many questions posed by the MDA 2002 study reportedly have been resolved or otherwise mitigated. The mineral resource estimate for the McMahon Ridge Deposit is based upon fences of angled drill holes that penetrate the individual ledge systems from top to bottom on 50- to 100-foot centers, perpendicular to the stike of the veins. The previous MDA resource estimate was defined solely by grade with no geology applied (MVGI., 2005)
- **Goldfield Main Deposit:** As indicated by MVGI, the Goldfield Main District was previously mined underground, and more recently by open pit methods. The historic production was from thick, approximately 100-foot-thick, shallow dipping zones, and from a number of relatively narrow, high-angle structures. This historic production has caused problems in estimating resources because of the presence of backfilled underground workings. The lack of diamond drilling in the district makes the detailed structural interpretation difficult, as well as identifying areas of stope fill. Reportedly,

> there is also a marked lack of check sampling for the various drill campaigns completed by previous operators. The mineral resource estimate for the Goldfield Main District prepared by MDA in 2002 is based on vertical drill holes spaced 50 feet apart. The drilling was directed at a gently-dipping tabular deposit. The previous MDA resource estimate was defined solely by grade with no geologic model applied (MVGI, 2005)

The following information regarding future exploration and development was obtained from the March 2005 MVGI report (MVGI, 2005). MVGI has conducted most of the recent exploration to date on McMahon Ride and the Gemfield Deposit. A minor amount of work has been completed in the Goldfield Main District and several other prospective exploration target areas. The focus of these programs has been to expand known resources, evaluate their potential mineability, and to explore still untested targets. Gemfield and McMahon Ridge areas reportedly had significant amounts of successful drilling. Reportedly, the new data have significantly expanded the known resources and significantly improved the understanding of the deposit. Reportedly, analysis of available data indicates that there may be opportunities to expand the resource at depth. The Gemfield District is previously evaluated as an open pit mine by Kennecott Exploration Company and later explored by Franco-Nevada for the high grade potential. The subsequent and highly successful infill-drilling program completed by MVGI has proven the continuity of mineralization and also has added significantly to the deposit by increasing overall grade and extending the outer limits, which are still open. The Goldfield Main District has the potential to expand the estimated resources, but there are some remaining questions regarding the underlying data that defines these resources.

The Tom Keane area is located approximately 5 miles east of the Goldfield Main District along the East Goldfield structural belt and southeast of the ring fracture zone. Previous drilling in the Tom Keane target area detected high-grade gold associated with main district style ledges. The strike length of the Tom Keane structural zone is approximately 1.6 miles as defined by intense hydrothermal alteration and anomalous gold mineralization. A total of 4,915 feet of exploration drilling was completed in the Tom Keane mine area in 2003.

Generalized Geologic Description. The geology of the district has been described comprehensively by Ransome et al. (1909) and only a brief description will be given here. The principal rocks are Miocene volcanic rocks that overlie a basement of Ordovician shale and chert (Palmetto Formation) and Mesozoic granitic rock. The principal host rocks in which ore shoots occur are the Milltown Andesite and an overlying dacite. Based on isotope studies, the age of other units are about 21.5 million years old. They are highly bleached and altered generally in a large eastward-elongated, elliptical belt that includes the principal productive part of the district. Elsewhere they have undergone only fairly weak propylitic alteration. The bleached rocks are argillized, alunitized, and silicified. Typically, the most silicified and alunitized rock forms more or less linear ledges enclosed in soft argillized rock. The individual ledges range from a few feet to hundreds, and locally, to thousands of feet in length and from a few feet to many tens of feet in width. They occur mainly within and parallel to the margins of an eastward, elongated elliptical area, which measures about 5 to 7 miles long east-west and 3 to 4 miles north-south. It can be demonstrated that the major faulting in the district occurred prior to alteration and mineralization, and it is apparent that the ledges, which dip mostly at angles steeper than 40 degrees, reflect an elliptical fracture system, possibly the rim facture zone of a caldera.

The principal mineralized belt is a quartz-alunite ledge system that trends generally north and dips 30 to 40 degrees east, but which in detail has many peculiar bends and irregularities. The dip generally flattens with increasing depth. Individual ore bodies contained in the ledge system were typically rather small, extremely irregular in shape, and often very high in grade. According to Locke (1912), the ore bodies were much like plums in a pudding, and only 6 percent of the aggregate lode areas revealed in all the levels of the Goldfield Consolidated was occupied by ore. However, in certain areas there was more or less an alignment of ore bodies down dip so that their distribution was not completely haphazard. Nevertheless, prediction of the location and grade of ore bodies was virtually impossible. The shape of some individual ore bodies was roughly equidimensional, lenticular, plate-like, or tabular, and some were even spindle-shaped. Feeders for ore bodies were difficult to find and follow, but apparently in some places they led to the discovery of ore bodies. Very little ore was found as deep as 1,000 feet (Albers and Stewart, 1972).

The gold was almost entirely in the form of very fine-grained native gold. Famatinite, bismuthinite, and pyrite were closely associated with it in the unoxidized ore, which generally extended to within 150 feet of the surface. The gold/silver ratio was about 3 to 1. That the ore mineralization is younger than the alunitization and silicification is shown by its occurrence along fractures within the altered rock.

The Goldfield Mining District in the broad sense also includes two other productive areas. One, the Sandstorm, was discovered a short while before the main district and is about a mile north of it. In the Sandstorm area, ore shoots containing native gold were localized at the intersections of fractures in rhyolitic rock. Production was probably about $1.5 million. The other productive area was Diamondfield, which achieved some stature as a mining district and is described separately (Ransome et al., 1909 and Albers and Stewart, 1972).

The Diamondfield Mining District is about 5 miles northeast of Goldfield in the northern segment of the elliptical belt of altered rock described in the section on the Goldfield Mining District. The district is a little over a mile long, and the western part is characterized by quartz-alunite ledges that trend east and dip nearly vertical. They are enveloped by argillized Milltown Andesite. There is limited detailed published information on Diamondfield, but apparently the ore bodies in the western part of the district were irregular, plunged steeply, and contained free gold as the ore mineral and very little silver. In contrast, the ore bodies at the eastern end of the Diamondfield District, were along a nearly flat fracture zone in highly silicified dacite and contained a much higher percentage of silver than any other ores in the entire Goldfield area. Total recorded production of the Diamondfield District is $52,305, but actual production may be as much as $1 to $2 million (Albers and Stewart, 1972).

A more modern interpretation of the geologic setting of the Goldfield Mining District is provided by MVGI, as follows. The Goldfield Mining District is located at the site of a complex and long-lived igneous center that is defined by eruptive vents located along a circular fault system or ring-fracture zone. The center of the ring fracture zone or core area has been domed-up by a late stage buried intrusive event that is believed to have been the source of hydrothermal fluids responsible for wall rock alteration and the metallic mineral deposits. Gold mineralization has occurred mainly along the ring-fracture zone within 600 feet of the surface in the Goldfield Main District and McMahon Ridge areas where fractures and faults have provided conduits for the mineralizing fluids. Volcanic rocks most frequently serve as host formations to mineralization along the ring fracture zone, but significant gold and copper ore has been mined from older pre-Tertiary basement rocks along the east side of the Goldfield Main District (MVGI, 2005).

Mineral/Energy Occurrences. The Goldfield ore deposits are irregular lodes in the fractured and highly altered country rocks. Replacement of the country rocks by quartz, kaolinite, alunite, and pyrite has occurred. The ore shoots are in the form of irregular bodies in the irregular lodes, and their limits can be determined only by assays. The principal ore bodies are in dacite, though some are in rhyolite, andesite, and latite, and low-grade ore with occasional rich shoots occurs at the latite-shale contact (Lincoln, 1923 and Albers and Stewart, 1972).

The principal gangue mineral is compact quartz derived from the silicification of volcanic rock, and associated kaolinite and alunite. The ore minerals occur mainly in the quartz, though at time, in or near alunite. They consist of fine-grained pyrite and marcasite, bismuthinite, goldfieldite, arsenical famatinite, native gold and tellurides, with minor amounts of other sulphides. Concentric shells of ore minerals around altered rock fragments are characteristic of the rich ore (Lincoln, 1923 and Albers and Stewart, 1972).

Based on information provided by MVGI, zones of high-grade gold mineralization occur in prominent fault structures and igneous dikes in the Goldfield Main, McMahon Ridge, and Gemfield deposits. These mineralized zones have a linear vein-like geometry and are referred to locally as ledges. In the case of the Gemfield Deposit the Sandstorm Rhyolite is particularly favorable for hosting disseminated gold mineralization adjacent to the high-grade silica ledges.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a high potential for conflicts between the NRL and the Goldfield Mining District based on the following:

- The three NRL alignments, including the two previous Caliente Rail Corridor alignments GF1 and GF5 and the most recently proposed alternate easternmost alignment, GF4, traverse portions of the Goldfield Mining District.
- Proposed alignment, GF4, may possibly interfere with the commercial/recreational gemstone fee collecting area in the Gemfield area as discussed in the Montezuma Mining District.
- Identified gold and silver resources and the potential for porphyry copper mineralization in the district.
- Favorable geologic environment for the occurrence of buried gold, silver, and copper ore deposits, large-scale gold and silver deposits and potential porphyry copper plays.
- Structures or favorable rock types controlling mineralization are traversed by or close to the NRL.
- Inferred and indicated ore reserves are traversed by or close to the NRL.
- Significant and successful on-going exploration programs have been and continue to be conducted by MVGI.
- Land status issues associated with patented and unpatented mining claims. The Goldfield Project area reportedly consists of 385 patented and 849 unpatented claims covering more than 20,600 acres in Esmeralda and Nye Counties.
- Environmental issues associated with past ore processing.

- Geotechnical issues associated with extensive underground mine workings.
- Geotechnical issues (rockfall, landslide, etc.) along the foot of Malpais Mesa, relatively close to proposed alternate alignment GF4.
- Potential cultural and archeological issues associated with historic mining structures, sites, etc. The NRL alignments traverse various historical structures and previous mining activities associated with the town of Goldfield. Proposed alternate alignment GF4 traverses historic structures at the western portion of the town of Goldfield, including a public cemetery.
- Open File Report 98-1, Mineral and Energy Resource Assessment of the Nellis Air Force Range (Tingley et al., 1998) reported a high potential, certainty level C, for epithermal gold mineralization, for areas within the NTTR, and a moderate potential, certainty level B, for bulk-mineable precious-metal deposits, in areas adjacent to and west of the NTTR. Tingley also stated that mineralization at Quartz Mountain (within both the Goldfield Mining District and the NTTR) is almost certainly part of the mineralized area of the main Goldfield District.

6.15 Klondyke Mining District (Plate ID No. 15)

Mining District or Area Name, Location, Map Reference Number. The Klondyke Mining District, also known as the Southern Klondyke District, lies in the southern Klondyke Hills, is located about 10 miles south of Tonopah, near the eastern edge of the county, and is referenced in this report as Plate ID No. 15 (Plate 1). It adjoins the Divide Mining District on the southeast and is sometimes considered a part of that district. The eastern portion of the Klondyke Mining District is approximately 2 miles west of the NRL. The majority of historic mining activity is in an area located approximately 3 miles west of the NRL.

History of Discovery, Exploration, and Mining. The district, according to Lincoln (1923) was discovered by Court and Bell in 1899. While on his way to this camp in 1900, Jim Butler discovered Tonopah. Up until 1905, about $50,000 was produced from one property in the district which produced through at least 1923, the date of the report. From 1908 to 1921 it produced 11,236 tons of ore containing a total value of metals valued at $263,700. Other sources report less production from the district.

Recent 2-inch by 2-inch wooden claim posts were observed at the southeast part of the district located by Mineral Exploration & Development Co. in Mina, Nevada. Reportedly this company is drilling between the Klondyke and the Goldfield Mining Districts (Ann Carpenter, personal. commun., 2004).

Generalized Geologic Description. Most of the deposits in the district occur in limestone of the Emigrant Formation (Middle and Upper Cambrian), which is cut by northwest-trending rhyolite dikes and intruded by irregular rhyolite bodies and one small granitic mass.

Mineral/Energy Occurrences. According to Ball, 1909, the deposits are of three types: (1) quartz veins, which are parallel to the bedding in the limestone and carry predominantly silver values; (2) veins along the contact of the sedimentary rocks and rhyolite dikes with values predominantly in gold; and (3) thin veins of quartz carrying silver-bearing galena and cerrusite in granite along joint fractures parallel to the bedding of the surrounding rocks. Other minerals present in small amounts are siderite, calcite, hematite, and wad.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflicts between the NRL and the Klondyke Mining District based on the following:

- Distance between the NRL and historically mined areas of the district.
- Apparent low recorded production of the district.
- Relatively small, narrow, localized areas of silver, gold, copper, and lead mineralization.
- Trends of structures controlling mineralization and favorable rock types appearing not to trend towards the NRL.
- Relatively recent claim staking (Mineral Exploration and Development Company) observed in the area.

6.16 Monitor Hills Area (Plate ID No. 16)

Mining District or Area Name, Location, Map Reference Number. The Monitor Hills area is located approximately 22 miles southwest of Tonopah and, for this report, includes areas both north and south of State Route 25. The area is referenced in this report as Plate ID No. 16 (Plate 1) and is not a defined mining district. The southern portion of the Monitor Hills area is approximately 4 miles north of the NRL. The decorative stone quarry identified in this report is located approximately 12 miles north of the NRL.

History of Discovery, Exploration, and Mining. Information regarding the history, discovery, exploration, and mining of this area was not identified during this investigation.

Personnel at the Tonopah BLM office indicated that Golconda Resources, Ltd. was active in the Monitor Hills Area for possible gold plays. To the north of this area, Diversified Stone Projects has a semi-active decorative rock quarry and reportedly, Golconda Resources, Ltd. was exploring this area as well.

During the June-July 2004 initial field reconnaissance, 2-inch by 2-inch wooden claim posts were observed in the area south of the decorative rock quarry and north of State Route 25. These claims appear to have been staked relatively recently; however, claim notices were not present on the claim posts.

The following information was obtained from the *Nevada Mineral Industry* (2003). Golconda Resources, Ltd. drilled on the South Monitor property and reportedly successfully intersected a quartz/adularia gold vein system. Assay results indicated that drilling intersected the veins high in the system, and they could potentially grade into a high-grade bonanza vein system below the level intersected by drilling. In the next phase of work, consisting of diamond drilling, is an attempt to intercept these veins at greater depth. At Monitor Flat, the initial drill program was successful in outlining a large hydrothermal gold system. The property, which lies on the gravel-covered southern slope of the Monitor Range, has about 1 percent outcrop consisting of three small hills. Golconda Resources, Ltd. reportedly will employ geochemical and geophysical methods in the next phase to try to outline the potassic alteration zones, which could contain substantial gold mineralization. Golconda Resources, Ltd. increased their claim holding from 540 acres to 1,740 acres. The following table summarizes ore reserves/resources and production history at the South Monitor property as provided in the *Nevada Mineral Industry* (2003) report.

Deposit Name	Reserves/Resources	Production History
South Monitor (west of Ellendale District)	1996: 250,000 oz Au 1997: 14 million tons, 0.026 opt Au, 0.12 opt Ag	(no data provided in reference)

According to the Golconda Resources, Ltd. website (Golconda Resources, Ltd., 2004), over 130 holes have been drilled in the South Monitor Hills, which have outlined strong alteration and erratic low-temperature gold mineralization in an area exceeding two square miles. Reportedly, Golconda Resources, Ltd. drilled three holes in September to test for bonanza, vein-type feeder zones. The grade of these zones, are approximately 1 ounce gold/ton and 10-ounce silver/ton. The zones are characterized by strong potassic alteration and occur at greater depths.

Reportedly, the bonanza veins appear to occur parallel to each other over an area of over 400 feet in width. Their length could be over 5,000 feet as at both ends silicified and gold-mineralized outcrops indicate the continuation of the gold mineralized system. The large size of the altered and mineralized area, and the possibility that the veins could continue for a mile in length, gives this property the potential to contain significant economic mineralization. Seven diamond drill holes reportedly are planned to intersect the veins at a depth of around 750 feet.

Generalized Geologic Description. In southern Nye County, the limestone and chert member that makes up the upper part of the Emigrant Formation crops out over an area of several square miles in the Monitor Hills. The formation there consists of interlayered thin beds of medium to dark-gray aphanitic limestone and laminated dark-gray to black chert that weathers brown. The chert beds average about 1-inch in thickness, and the limestone beds are somewhat thicker.

Mineral/Energy Occurrences. The limestone and siltstone member currently quarried north of the Monitor Hills and north of State Route 25 consists of closely interlayered beds of medium-gray aphanitic to very finely crystalline limestone; light gray, pale red, and pale, purple-red, papery-splitting, fine siltstone; and minor amounts of medium gray, thinly laminated, silicified limestone (Stewart, 1966).

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low to medium potential for conflicts between the NRL and the Monitor Hills Area based on the following:

- Previous reported mineral exploration and recent and on-going exploration programs by Golconda Resources, Ltd. have defined potential silver and gold resources in the southern Monitor Hills and the Monitor Flat area, in close proximity (2 to 4 miles) to the NRL.
- A decorative stone quarry is 8 to 10 miles away from the NRL.
- Apparent absence of this area being defined as a mining district.

6.17 Ellendale Mining District (Plate ID No. 17)

Mining District or Area Name, Location, Map Reference Number. The Ellendale Mining District, also known as the Salisbury Mining District, is located in the southern end of the

Monitor Range, about 31 miles east of Tonopah ,and is referenced in this report as Plate ID No. 17 (Plate 1). The district is mainly in the small portion of the Monitor Range lying to the south of U.S. Highway 6. The southern portion of the Ellendale Mining District is approximately 4 miles north of the NRL.

History of Discovery, Exploration, and Mining. The Ellendale Mining District reportedly was discovered in 1909 and is noted for its past gold production, but had produced silver, some copper, and some barite in the 1930s. The initial discovery in the district occurred when leaf gold was reported to coat a small fracture in a small pit, located by Jim and Ellen Clifford in 1909. It yielded about 60 sacks of high-grade ore, each worth about $1,000. The figure given by Ferguson (1917) for rich ore produced in 1909 was approximately $40,000. Conflicting data indicate that Ellendale declined by 1912 (Paher, 1970) or at least by 1915 (Kral, 1951). Small amounts of barite were produced from the Jumbo Mine from 1931 to about 1960.

The South Monitor and Monitor Flat properties being explored by Golconda Resources, Ltd., is discussed as part of the Ellendale Mining District in *Nevada Mineral Industry* (2003).

Generalized Geologic Description. Geology of the Ellendale Mining District is complex and generally consists of sequences of Paleozoic and Tertiary rocks that are locally mineralized, and their stratigraphic sections have not been fully established (Kleinhampl and Ziony, 1985).

The oldest strata, quartzitic siltstone, quartzite, phyllitic shale, and limestone of Late Precambrian (?) to Early Cambrian age, crop out near and on the flanks of the highest peak, at 7,281 feet, of the district. Some of the Precambrian and Cambrian strata at Ellendale are grouped with the Zabriskie Quartzite, and others with the phyllitic shale unit.

The Tertiary rocks are of diverse origin and composition and include rhyolitic to basaltic andesite flows, dikes, and plugs, and rhyolitic to rhyodacitic-welded tuffs, tuffs, and tuffaceous sedimentary strata. The plutonic bodies exposed in the district include Tertiary quartz diorite and Late Cretaceous or Tertiary hornblende biotite diorite porphyry.

The extensive host rocks for the main gold deposits at the Ellendale Mine and vicinity are rhyolite plugs and domes, irregular masses, and dikes of uncertain stratigraphic position. Small aphanitic to porphyritic dacitic and andesitic plugs and dikes intrude the rhyolite, and even some of these young intrusive rocks are altered.

The Paleozoic rocks are cut into a series of imbricate plates by low-angle faults. The thrust plates may be related to the mid-Paleozoic Antler orogeny. Numerous steep Tertiary faults disrupt the Paleozoic and Tertiary rocks, and some faults place Tertiary rocks against Paleozoic. The main part of the Ellendale Mining District is perhaps best described as a volcanic center where the intrusion of rhyolitic to dacitic dikes and plugs, and the formation of protrusive domes, were the last events of the sequence. The metamorphosed Paleozoic strata in the southeastern part of the district are believed to conceal a shallow pluton.

Mineral/Energy Occurrences. Gold has been the most valuable commodity produced in the district, and some of the ore was quite rich. The richness of the ore indicated that the native metal must have occurred in some of the veins, and leaf gold-coated fractures. At the Ellendale mine and vicinity, the hosting rhyolite is sheared and fissured mainly along a plane striking generally northeast and dipping about 50 degrees southeast. The fault and fissure zones, from several inches to a few feet, are locally tight and contain only a little gouge or iron stain, while in others several feet of gougy, brecciated material rests against a smooth footwall.

Barite deposits at the Jumbo mine are described as replacement deposits in a 30-foot-wide limestone underlain by a quartzite-shale sequence, all of which strike northwest and dip about 50 degrees southwest. The ore body is irregularly lenticular, feathers out laterally, and has apparently replaced the Paleozoic strata.

A warm spring, Coyote Hole Spring, is located approximately 1 mile southeast of the southern boundary of the mining district in the direction of the NRL. No current geothermal leases are present in the area, suggesting this is not a highly prospective geothermal target.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflicts between the NRL and the Ellendale Mining District based on the following:

- Distance between the NRL and historically mined and currently identified areas of mineralization in the district.
- Apparently, relatively small, narrow, localized vein deposits with zones of high-grade gold and silver mineralization as well as localized replacement deposits (Jumbo barite mine) and areas of base metal mineralization.

6.18 Golden Arrow/Silver Bow Mining Districts (Plate ID No. 18)

Mining District or Area Name, Location, Map Reference Number. The Golden Arrow Mining District, also known as Blake's Camp, is located on a plain just west of the Kawich Range, about 50 miles east of Tonopah and is referenced in this report as Plate ID No. 18 (Plate 1). The northwestern portion of the Golden Arrow Mining District is approximately 1 mile southeast of the NRL. The Silverbow Mining District is to the southeast, approximately 5 miles from the Golden Arrow Mining District, and at its closest is 12 miles from the NRL.

History of Discovery, Exploration, and Mining. Blake's Camp was reportedly discovered in 1905, the same year that the prospects at Golden Arrow were being explored. The production of the camp has been small; a few tons of ore was shipped from the Cotter property to the West End Mill at Tonopah in 1916 (Lincoln, 1923). Additional historic information regarding the district was not identified.

It is unknown when the mining district was discovered, but by approximately 1916, most of the exploration had been done and there had been a small amount of gold and silver production from pyrite-metal-bearing quartz veins and veinlets hosted in rhyolitic tuffs and andesites. Silver appears to be the dominant metal in this system, and high silver to gold ratios are anticipated, similar to those found in the Clifford and Bellehelen Districts to the north (Cornwall, 1972 and Kleinhampl & Ziony, 1984).

The best available data indicate that the Golden Arrow, Gold Bar, and Desert Shafts are pre-1917 in age. There has been intermittent exploration and development since the early 1900s, including exploration during the 1940s on the Jeep claims (2 miles east), up through present exploration drilling and development work by junior and major mining companies (Tingley et al., 1998).

Most of the activity in this district is associated with more recent exploration work, where drilling by a series of major and junior mining companies over the past 10 to 15 years has identified approximately 350,000 ounces of gold (silver mineralization estimates are unknown) hosted in altered volcanic rocks. Reportedly, a precious metal resource continues to be identified and expanded at this project via work completed by Kennecott in the early 1990s, to present activity by the current exploration company (Ann Carpenter, personal comm., 2004).

In June 2004, BLM Tonopah personnel indicated that recently, a junior Canadian mining company drilled in this district and identified small gold resources in this area.

According to the *Nevada Mineral Industry* (1997), at the Golden Arrow Mining District, Tombstone Explorations acquired the Golden Arrow project (composed of 16 patented and 419 unpatented claims) from Kennecott Explorations and commenced drilling late in 1997. Previous operators estimated resources of 11.3 million tons at 1.34 grams of gold per ton from two zones at Golden Arrow.

According to information provided in *The Nevada Mineral Industry,* (2003), Phase II drilling was underway on the Pacific Ridge Exploration Ltd Golden Arrow property. The 2003 Phase II program reportedly called for about 25,000 feet of drilling on two-high-grade, epithermal gold vein feeder systems within the Gold Coin and Hidden Hill Zones, as well as initial drilling of the large, recently discovered Sunrise target.

The following table summarizes ore reserves/resources and production history at the Golden Arrow property as provided in the *Nevada Mineral Industry*, (2003) report.

Deposit Name	Reserves/Resources	Production History
Golden Arrow (Golden Arrow District)	1997: 12.4 million tons, 0.039 opt Au resource	(no data provided in reference)

According to a 27 September 2004, news release issued by Pacific Ridge Exploration Ltd.,(2004), the Board of Directors of Pacific Ridge Exploration Ltd. advised Nevada Sunrise LLC on 27 April 2004, that Pacific Ridge would not be proceeding with further work at the Golden Arrow property located in Nye County, Nevada, and accordingly, the option agreement between Pacific Ridge and Nevada Sunrise was terminated effective 27 April 2004. Pacific Ridge's decision to relinquish the Golden Arrow property reportedly was based on exploration results not meeting corporate objectives (Pacific Rim Exploration Ltd, News Release, 2004).

Generalized Geologic Description. The very small district production of gold and silver came from pyrite-bearing veins that occur along faults in rhyolitic tuffs of White Blotch Spring and in andesite. The country rock at Blake's Camp is Tertiary rhyolite. At Golden Arrow, andesite has been faulted into contact with rhyolite.

Mineral/Energy Occurrences. At Blake's Camp, a fault zone in the rhyolite has been crushed and more or less iron and manganese-stained and contains free gold. At Golden Arrow, ore occurs along a fault between andesite and rhyolite and in veins associated with it, principally in the rhyolite. The wall rock near the fissures is silicified. The ore consists of quartz veinlets in which pyrite is the chief metallic mineral. Native gold occurs in a finely divided state and is alloyed with silver; in some of the ore, the silver values exceed the gold (Lincoln, 1923).

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a medium-high potential for conflicts between the NRL and the Golden Arrow Mining District based on the following:

- Mining district is relative close to the NRL.
- Distance between the NRL and areas of recent exploration and identified ore reserves currently is not known.
- The NRL appears to overlap some of the mining claims in the area.
- Structures controlling mineralization and favorable rock types appear to trend toward the NRL.
- The area has been the site of numerous mineral exploration programs that reportedly have led to the estimation of an approximately 300,000- to 350,000-ounce gold resource.

6.19 Guard Station Area (south end of Stone Cabin Valley) Area (Plate ID No. 19)

Mining District or Area Name, Location, Map Reference Number. The Guard Station Area is located in the middle of Cactus Flats, southwest of Reeds Ranch near the Guard Station for NTTR, and is referenced in this report as Plate ID No. 19. The NRL appears to traverse the Guard Station Area.

History of Discovery, Exploration, and Mining. Information regarding the mining history of the area is not available and was not identified during this investigation. Recent mining claims were observed during the initial field reconnaissance and reportedly were staked sometime in the fall of 2004.

Generalized Geologic Description. This area is Quaternary alluvium and probably underlain by rock types similar to the mountains adjacent to Cactus Flats.

Mineral/Energy Occurrences. There does not appear to be known mineral occurrences in this area, based on this investigation.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflicts between the NRL and the Guard Station Area based on the following:

- The NRL traverses portions of the area.
- Recent mining claims have been staked within and adjacent to the NRL.
- No obvious mineral occurrences in this area.

6.20 Bellehelen Mining District (Plate ID No. 20)

Mining District or Area Name, Location, Map Reference Number. The Bellehelen Mining District is located on the north end of the Kawich Range about 50 miles east of Tonopah and is referenced in this report as Plate ID No. 20 (Plate 1). The district is approximately 3 to 4 miles southeast of the NRL.

History of Discovery, Exploration, and Mining. Reportedly, the first discovery made in the district was of gold in 1904, interest remained strong into 1907, with the best mining years in 1909 to 1910. An unconfirmed production of $500,000 by one operator sometime before the 6-year period was reported by Paher (1970). The Pacific States Mining and Milling Company. reportedly started a large operation and produced about $117,000 between 1917 and 1921 and then merged with the Tonopah-Kawich Mining Company to form the Bellehelen Merger Mines in 1922. They intermittently operated a 50-ton cyanide mill until closure in 1927.

The recorded silver and gold production was only $29,473 from 438 tons in 1918 and is said by Kral (1951) to have come from the Doreen group of claims, first worked around 1915. Kral also reported that $4,000 worth of gold ore was shipped in 1935 from the Peterson Mine, which lies just west of the Bellehelen Merger.

Based on the field reconnaissance, there appears to be relatively recent drill roads and evidence of recent exploration in the central portion of the mining district in the vicinity of the historic mine workings. New 2-inch by 2-inch wooden claim posts were observed at the mouth of the canyon leading up to the main mine area. According to BLM records, there is a Plan of Operation or Notice of Intent filed in an area toward the front of the range to the northwest; however, indications of drilling in this area appeared to be absent.

Generalized Geologic Description. Tertiary ash-flow tuffs, welded to nonwelded, and some bedded air-fall tuffs are the host rocks for the silver deposits and underlie most of the mountainous terrain at the north end of the district. The rocks are rhyolitic to rhyodacitic in composition. The ash-flow tuffs are commonly silicified and argillized in the vicinity of the workings, but the Tertiary intrusive rock is relatively fresh and exhibits a glassy margin.

The northern Kawich Range is inferred to be a resurgent caldron modified by basin-and-range faults. The large intrusive body may represent a shallow part of an inferred magma system that existed beneath much of the northern Kawich Range and may have been responsible for the resurgence.

Northwest-trending lineaments, inferred to be faults, approximately coincide with the beltlike distribution of the mines and prospects in the district. These northwest-trending features form a segment of the Kawich-Toiyabe lineament that continues northwestward for about 60 miles. Part of this major lineament at the Bellehelen Merger ground and vicinity contains closely spaced, east-trending fissures, many quartz-filled, that are cut by north-trending fractures (Kleinhampl and Ziony, 1985).

Mineral/Energy Occurrences. The major mine in the district, the Bellehelen Merger, was developed with several thousand feet of workings on several silver-bearing quartz stringers in fissures. The stringers, each 3 to 4 inches wide, were distributed over an area about 15 feet wide at the surface and joined at depth to form a more persistent and wider vein. The vein yielded oxidized ore above the 250-foot level of the mine and contained so much sulfide below the level that the ore required smelting. Comb quartz, often containing sparsely disseminated, gray submetallic material and hematite, fill some of the structures and contain the ore deposits.

The Peterson Mine to the west of the Bellehelen Merger ground had ore in pipes and shoots. Silver, chiefly as cerargyrite, and some gold occurs in 2- to 3-inch-wide veins (Kleinhampl and Ziony, 1985).

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low to medium potential for conflicts between the NRL and the Bellehelen Mining District based on the following:

- Distance between the NRL and historically mined areas of the district and the currently identified areas of mineralization.
- Recent mining claims were staked and exploration efforts (Notice of Intent or Plan of Operation) exist within and adjacent to the NRL.
- Northwest-trending structures controlling high-grade silver and gold mineralization and favorable rock types appear to trend toward the NRL.
- Reportedly (BLM Tonopah), mineral exploration efforts were conducted at the Ajax Mine last year.

- Known mineral occurrences in the district are possibly associated with the regional scale Kawich-Toiyabe trend.

6.21 Clifford Mining District (Plate ID No. 21)

Mining District or Area Name, Location, Map Reference Number. The Clifford Mining District is located approximately 2 miles south of U.S. Highway 6 in Stone Cabin Valley, about 6 miles southwest of Warm Springs and is referenced in this report as Plate ID No. 21) (Plate 1). The NRL traverses a portion of the Clifford Mining District.

History of Discovery, Exploration, and Mining. According to Sawyer (1931), Kral ,(1951), and others, the first silver discovery in the area was made in 1906. The town, whose name changed to Helena in 1907 and then reverted back to Clifford, had a peak population of 500 in 1908. The camp declined thereafter, with intermittent activity continuing at the Clifford property since that time. Reported production from the district ranges from none to more that $500,000.

At the time of a visit by Ferguson in 1917, most of the work in the district had been done in the near-surface oxidized ores, and the richest streaks were profitable for only a few feet from the surface. The Clifford Mine was described by Kral in 1951 as consisting of a 300-foot and a 400-foot-deep vertical shafts. The mine was operated intermittently by the Western Gold Corporation and lessees from 1925 to 1946, with 260 tons of ore containing 2 ounces of gold and 4 ounces of silver per ton shipped in 1930. Parts of the dumps were shipped to a smelter in 1941 and 1946. The last known lessees were on the property in the mid-1960s for at least six months.

The following information was obtained from *The Nevada Mineral Industry* (2003). Castleworth Ventures, Inc. began fieldwork at their Clifford Property in preparation for a planned drilling program. The property reportedly consists of 135 claims totaling 2,700 acres centered on the Clifford Mine. Initial fieldwork reportedly will include follow-up surface sampling and mapping combined with a very low frequency (VLF) electromagnetic geophysical survey to develop detailed drill targets on the property. While the district reportedly has no official published production, ore is known to have been shipped to the Merger mill at Bellehelen and the West End plant in Tonopah. Estimated gold production is in the 15,000- to 20,000-ounce range from a number of shallow shafts and cuts, with two shafts in excess of 200 feet.

According to the January 12, 2004, news release, Seabridge Gold, Inc. reported that its joint venture partner, Castleworth Ventures, Inc., has commenced a Phase 1 drilling program at the Clifford Project in Nye County, Nevada. Drilling at Clifford reportedly targeted two types of deposits; near-surface mineralization, since previous near-surface sampling strongly suggested an oxide target with attractive grades within Clifford Hill. This concept was to be tested with both shallow holes on moderate spacing as well as with the shallower portions of the deeper holes. The second target to be tested is the feeder zones, which have acted as conduits to the near-surface mineralization. The news release stated there is good evidence that the mineralization of Clifford Hill is the surface expression of the intersection of two highly mineralized regional-scale structures that provide a very compelling high-grade target at depth (Seabridge Gold, Inc., 2004).

According to the February 2004 Castleworth Ventures, Inc. new release, an exploration drilling program consisting 17 holes was completed. Reportedly to date, 11 of the first 14 holes encountered anomalous to high-grade gold mineralization. One hole, CL10-04, reportedly intersected a 10-foot interval containing 1.73 ounce per ton gold with 6.00 ounce per ton silver from 150 to 160 feet. Castleworth Ventures, Inc. plans to continue their program with additional drilling intended to further define this new discovery (Castleworth Ventures, Inc., 2004).

The Clifford Hill prospect, located near the center of the Clifford Project, is one of several shallow, high-grade targets on the property. The property consists of 206 claims, bringing the total current property position to over 4,000 acres. The project lies approximately 10 miles north-northeast of the Golden Arrow deposit currently being actively explored in the Warm Springs District. The project is part of the Thunder Mountain Joint Venture between Castleworth and Pacific Intermountain Gold, a 75 percent-owned subsidiary of Seabridge Gold Corp (Castleworth Ventures, Inc., 2004).

Generalized Geologic Description. Clifford Hill is primarily comprised of thin-bedded rhyolitic sandstone and pyroclastic rocks, rhyolite tuff, and breccia, while andesite outcrops to the west.

Mineral/Energy Occurrences. The ore consists of heavily iron-stained tuff cut by small quartz veins that contain small, irregular masses of limonite. Cerargyrite, native silver, and jarosite occur in the rich ore, with rare specks of silver sulfide and pyrite and small amounts of pale yellow gold. Sulfide ore has been mined in rhyolitic agglomerate at its contact with the andesite, which appears to have been faulted against it. The agglomerate has been highly pyritized. The rich ore contains less pyrite and is cut by quartz in the vugs, in which has been deposited stephanite, pyrargyrite, and proustite, with pyrite and more rarely marcasite, while silver sulfide minerals also occur in minute streaks between the quartz and the wall rock (Kleinhampl and Ziony, 1985).

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a high potential for conflicts between the NRL and the Clifford Mining District based on the following:

- The NRL traverses the mining district and bisects mining claims (reportedly approximately 135 claims totaling 2,700 acres exist in the mining district), and possibly mine workings.
- Favorable geologic environment for the occurrence of buried gold and silver ore-grade mineralization.
- Structures or favorable rock types controlling mineralization are traversed or close to the NRL.
- Ongoing exploration programs conducted by Castleworth Ventures, Inc., reportedly with estimated gold production in the 15,000- to 20,000- ounce range from shallow shafts and cuts, and two deeper shafts.
- Geotechnical issues associated with extensive underground mine workings.
- Cultural and archeological issues associated with historic structures.
- Land status issues associated with mining claims.

6.22 Warm Springs Area (Plate ID No. 22)

Mining District or Area Name, Location, Map Reference Number. The Warm Springs area is located near the junction of U.S. Highway 6 and Nevada Highway 25 in Hot Creek Valley, referenced in this report as Plate ID No. 22 (Plate 1). The NRL is located approximately 1 mile south of the Warm Springs area.

History of Discovery, Exploration, and Mining. The history of the discovery and development of the hot springs in the area was not identified. Several abandoned structures and a spring-fed swimming pool currently occupy the hot spring area.

Geothermal leasing rights for 1,312 acres in the Warm Springs area were granted by bid to the Getty Oil Company in 1977.

Generalized Geologic Description. The standard carbonate facies of eastern Nevada, including Cambrian to Mississippian rocks, is clearly recognizable in the Paleozoic section of the southern Hot Creek Range. Tertiary volcanic and sedimentary rocks lie unconformably on the deformed and tilted Paleozoic rocks.

Low-angle faults are present near Warm Springs where imbricated plates of allochthonous Devonian strata are structurally imbricated with Devonian and Mississippian rocks of the autochthon. High-angle faults are abundant, and the Paleozoic strata are considerably more intricately faulted than the Tertiary rocks. Most of the large high-angle faults strike northward, but some strike northwest and a few strike northeast.

Mineral/Energy Occurrences. One hot spring with waters reported >37 degrees Celsius (C) exists in the area (Shevenell and Garside, 2003).

District/Area Summary and Potential Conflict. Based on the preliminary scope of the study, there appears to be a low potential for conflicts between the NRL and the Warm Springs area based on the following:

- Distance of the NRL to the identified hot springs area.
- Minimal development of the known geothermal resources.
- It is interpreted that the geothermal resources occur on a north-south-trending range-front fault that continues south through Reveille Valley.

6.23 Tybo Mining District (Plate ID No. 23)

Mining District or Area Name, Location, Map Reference Number. The Tybo Mining District, also known as Hot Creek, Keystone, Empire, Argenta, Rattlesnake Canyon, Milk Spring, and Tyboe, is located in the Hot Creek Range, extending from Warm Springs on the south to Hot Creek on the north, and is referenced in this report as Plate ID No. 23 (Plate 1). The NRL is located approximately 1/2 mile south of the southern portion of the Tybo Mining District.

History of Discovery, Exploration, and Mining. According to Lincoln (1923), the Hot Creek section of the district was discovered in 1865 by an Indian who showed it to white prospectors in 1866. By 1868, two 10-stamp mills operated. The Tybo section was discovered in 1870 by Gally and Gillette. A smelter was erected in 1874, and the Tybo Company built another furnace in 1875 and another 20-stamp mill. For a number of years, Tybo produced large quantities of silver and lead with less gold and was the most prosperous district in Nye County. A 75-ton concentrator was built by The Louisiana Consolidated Mining Co. in 1917 and operated in 1918. In 1919, a floatation plant and smelter were installed, which operated in 1920. These operations did not meet with success, and the company was forced to shut down.

Leasing at Tybo proper was almost continuous from that time until about 1951, and 29,139 tons of ore with a value of $393,229 was produced. Recent exploration efforts include the rehabilitation of shafts in 1961, geophysical studies in 1971, development drilling in 1972, and other exploration activities in 1979 (Kleinhampl and Ziony, 1985).

Approximately 800,000 tons of base-metal silver ore was reportedly verified by drilling in 1965 on the Dexter property by Pinex Mines. The ore was reported to be within 350 feet of the surface (Eureka Miner, 1972).

According to the NBMG, *Nevada Mineral Industry, 2000*, Boulder Minerals planned to spend $50,000 to earn 75 percent interest in the Tybo West silver-gold property 50 miles northeast of Tonopah. Exploration targets are large, sediment-hosted manto and chimney-style deposits with high-grade values. Reportedly to date, six targets were identified from basic prospecting. Subsequent NBMG *Nevada Mineral Industry Special Publications*, (2001, 2002, and 2003), do not mention activity in the Tybo Mining District, and it is not known at this time whether the mineral-planned exploration was conducted.

Generalized Geologic Description. Paleozoic strata about 10,000 to 12,000 feet thick are exposed along the east flank of the Hot Creek Range in the heart of the Tybo Mining District and are unconformably overlain by Tertiary volcanic rocks. The Paleozoic sequence hosts the main silver-bearing Tertiary dikes of the district, which follow preexisting faults in the Paleozoic rocks.

Mineral/Energy Occurrences. Silver with some gold occurs chiefly in an argentiferous lead-zinc sulfide ore that forms tabular vein-like bodies along faults. The ore replaces quartz latite porphyry dikes to a large extent, and to a lesser extent, limestone. Manganese oxide with quartz and manganiferous calcite is present in many of the veins.

Pyrite, sphalerite, galena, chalcopyrite, pyrhotite, and arsenopyrite are the primary sulfide minerals. Pyrite is the most abundant sulfide, and at least some sulfide existed in all the ore.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a medium potential for conflicts between the NRL and the southern end of the Tybo Mining District based on the following:

- The NRL is located within approximately 1/2 mile of historically mined areas of the district.
- Favorable geologic environment for the occurrence of high-grade gold and silver, as well as base-metal ore-grade mineralization appear to extend into the NRL.
- Mineral reserves have been "verified" within the Tybo Mining District.
- Reportedly, there has been relatively recent (2000), planned exploration efforts directed at identifying six target areas of gold and silver mineralization.
- Microwave tower area is a potential clay source and consists of pervasively altered bleached and argillized rhyolite tuff.

6.24 Mercury Mountain Mining District (Plate ID No. 24)

Mining District or Area Name, Location, Map Reference Number. The Mercury Mountain Mining District, often included as part of the Tybo Mining District, is located in the M and M Canyon area of the southwestern Hot Creek Range, referenced in this report as Plate ID No. 24 (Plate 1). The NRL is located approximately 6 miles south of the southern portion of the Mercury Mountain Mining District.

History of Discovery, Exploration, and Mining. Mercury was discovered in 1929 in M and M Canyon, southwest of Tybo. Baily and Phoenix (1944) reported a yield of 189 flasks and 59 flasks at the A and B and the M and M Mines, respectively, to the end of 1943. Additional small production in the early 1950s and a very little in the early 1960s at these properties, and possibly from other nearby small deposits (Break Mine), may have amounted to 50 to 100 flasks (estimated). The total amount of mercury produced, though uncertain because good annual data was absent , may be on the order of $50,000 (prices at the time of sale).

Generalized Geologic Description. Mercury deposits are restricted to the Tertiary rocks in the vicinity of M and M Canyon. Host rocks of the main deposit are faulted, gently to moderately tilted, argillized late Oligocene and early Miocene rhyolitic to rhyodacitic ask-flow tuffs. The mined ore bodies were small, and the largest stope at the A and B property was 20 x 30 x 20 feet. A larger stope, 65 x 25 x 25 feet, is in the upper adit of the M and M mine. An unaltered and lithified part of the Shingle Pass Tuff caps the mineralized units.

Mineral/Energy Occurrences. Mineralization in the district is of two types; disseminations in discontinuous, irregular fractures and rocks next to these fractures, and deposition in throughgoing fractures near faults. Talus blocks of silicified breccia indicate that deposition was also in fault zones in the upper devitrified, densely welded tuff (Kleinhampl and Ziony, 1985).

The disseminated deposits are associated with clay at the base of Shingle Pass. The clay is kaolinite, and the main minerals are cinnabar and metacinnabarite with some native mercury, calomel, and livingstonite. The fracture-filling deposits occur in the partly welded devitrified basal zone, and the ore mineralogy is the same as in the disseminated deposits (Kleinhampl and Ziony, 1985).

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflicts between the NRL and the Mercury Mountain Mining District based on the following:

- The NRL is located approximately 7 miles north of historically mined areas of the district.
- Mercury mineralization that appears to be associated with narrow veins and veinlets and some disseminated areas in altered volcanic rocks appears to have no discernable district-wide trend.
- Apparent absence of this type of mineralizing environment between the historically mined area and the NRL.

6.25 Reveille Mining District (including the Arrowhead Mining District) (Plate ID Nos. 25 and 26)

Mining District or Area Name, Location, Map Reference Number. The Reveille Mining District includes the area on both sides of the northern part of the Reveille Range. It consists of the New Reveille camp on the west side and the Old Reveille on the east side, referenced in this report as Plate ID No. 25. The Arrowhead Mining District, referenced in this report as Plate ID No. 26 is located to the adjacent north of the Reveille Mining District (Plate 1). The NRL is located approximately 8 to 9 miles west of the eastern portion of these mining districts.

History of Discovery, Exploration, and Mining. The Reveille Mining District was organized around the Old Reveille camp in 1867 shortly after the first mineral discovery in 1866 by a Native American named Indian Jim (Lincoln, 1923), who showed it to prospectors. A 5-stamp mill built in 1867 and a 10-stamp mill built in 1869 operated for a short time, but the district is not credited with much production until 1875. During four years of operation of this mill, nearly half the district's total yield was obtained. Mining began at the New Reveille about in the 1880s and shipped a large amount of ore at that time. Kral (1951) reported that most production between 1911 and 1950 is unrecorded and came from the New Reveille.

Gold Creek Mining Company began exploratory drilling in the Reveille Mining District in early 1977 and was open pit mining, crushing, and stockpiling material on heap leach pads in the winter of 1978-1979. In 1980, three open-pit mines, the Gila, West Reveille, and South Reveille, were operating in the district. The properties passed to the Gila Mines Corporation, which conducted exploratory drilling in 1982.

Reportedly, the Arrowhead Mining District originally referred to as the Needles District in 1919, had a short productive life, with the majority of production ending around December 1921 (Kleinhampl & Ziony, 1985). The Arrowhead Mine has drifts on four levels off the 345-foot-deep inclined shaft. The Arrowhead Extension on the south has a two-compartment shaft 150 feet deep with a vein opened at 55 feet. A few prospects in the Tertiary rocks are collared in structurally lower and stratigraphically older rocks, as with the propylitized andesite. Similar prospects occur outside the arcuate main altered zone (Kleinhampl & Ziony, 1985).

There appears to be recent activity in the area based on information provided by Tonopah BLM, indicating that two separate Notices of Intent were filed for the Arrowhead Mining District in 2003.

Generalized Geologic Description. Paleozoic and Tertiary rocks underlie the Reveille Mining District and, in contrast to many other districts in northern Nye County, the Tertiary stratigraphy and structures appear to be even more complex than those of the Paleozoic.

The exposed Paleozoic section consists of about 4,700 feet of sedimentary strata. Basal exposures are of the upper part of the Antelope Valley Limestone of the Pogonip Group and are overlain successively by other well-known formations of the eastern Nevada carbonate assemblage.

Tertiary volcanic rocks generally lie unconformably on and are faulted against Paleozoic rocks. They consist of welded ash-flow tuffs and lavas as well as lesser amounts of air-fall tuffs, tuffaceous sedimentary strata, and debris beds, including landslide material. Tertiary dikes and sills are also present. Several cut the exposed Paleozoic strata, but most of the abundant exposed dikes, sills, and miscellaneous intrusive bodies cut other Tertiary rocks. The composite Tertiary section totals about 13,000 feet in thickness. Original depositional lenticularity and erosional removal account for drastically different thicknesses from place to place, and at any one locality the section is generally no more than a few thousand feet thick.

The northern half of the Reveille Range consists essentially of a gently west-tilted core block of Paleozoic strata broken into a separate megamosaic, and bounded on all sides by faults that separate the core from generally less intensely but complexly faulted Tertiary rocks. The faults within the core block are inferred to be mainly normal faults related to basin-and-range tectonism. Structure of the Tertiary rocks appears to be related to volcanism modified by typical normal faulting associated with basin-and-range tectonism.

At the Arrowhead Mining District, Tertiary volcanic rocks are in an area of complex, unusual tectonic features. Surficial mine workings in the altered shear zones are commonly developed in Miocene welded tuffs that form a structurally intermediate plate of localized thrust and overlie Oliogocene welded tuff (intracaldera Monotony Tuff). Some of the deeper workings may penetrate the plate, and some of the workings at a few mines, including the Arrowhead mine, are developed partly in a post-thrust rhyodacite intrusive mass. The 345-foot-deep Arrowhead may have passed entirely through the Tertiary section into the underlying Paleozoic rocks, because the small amounts of segregated material on its extensive dump are calcitized quartzite and pyritized calc-hornfels. Alternately, the pre-Tertiary rocks may represent faulted slivers or breccia fragments related to the major transcurrent faults that cut the area (Kleinhampl and Ziony, 1985).

Mineral/Energy Occurrences. The Reveille Mining District was originally prospected for gold and silver, and major silver production came mainly from two mines, the Gila at the Old Reveille camp and the new Reveille at the New Reveille camp. Another property, the Antimonial, was mined for antimony minerals. Early reports (Ball, 1909) noted that near-surface ore at both the Gila and New Reveille mines was oxidized and consisted mainly of cerargyrite and cerrusite. Galena, malachite, azurite, and a gangue of quartz and gypsum were also noted. Stibnite constituted the main ore mineral at the Antimonial mine.

The New Reveille camp yielded silver-bearing lead and zinc ores, possibly argentiferous varieties of galena and sphalerite, that contained sporadically distributed gold averaging

0.10 ounce per ton. At the Gila mine at the Old Reveille camp, gossan, boxworks, and silicified masses, originally limestone, commonly fill steeply northwest-dipping shear zones along with iron oxides, sphalerite, barite, and occasionally, secondary molybdenum minerals. At the Antimonial mine, Tertiary rock hosts a major north-dipping, stibnite-bearing vein and several other veins, with quartz and gouge characterizing the main vein. Pods in the veins form mineable lenses, and antimony oxide and oxysulfide and pyrite are common. Gold, silver, and selinum are also present (Lawrence, 1963).

Pyritized zones, most characteristic of metallization in the district, are well developed at the Arrowhead Mine and vicinity. The dump of the Arrowhead Mine is composed mostly of altered rhyodacite, some of which contains disseminated pyrite. The welded tuffs of the arcuate-altered zone are pervasively and intensely bleached, argillized, and silicified, whereas many of the volcanic rocks outside the zone are less intensely altered. At the Arrowhead Mine, two ore shoots 3 to 8 feet wide in a replacement vein contained silver sulfide ore that averaged $24 to $50 a ton in 1922 and 1923 (Kleinhampl and Ziony, 1985).

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflicts between the NRL and the Reveille and Arrowhead Mining Districts based on the following:

- Approximately 7 to 9 miles separates the NRL and the currently identified potential mineral resources.
- Presence of relatively narrow and localized silver, lead, zinc, and copper mineralization (veins in fractures and replacement deposits).
- Structures controlling mineralization and favorable rock types do not appear to trend toward the NRL.
- Apparently low potential for the occurrence of sand and gravel and other construction materials in the area on the west flank of the Reveille Range.

6.26 Eden Mining District (Plate ID No. 27)

Mining District or Area Name, Location, Map Reference Number. The Eden Mining District is located at Eden on the east slope of the Kawich Range, approximately 55 miles east of Tonopah, and is referenced in this report as Plate ID No. 27 (Plate 1). The NRL is located approximately 3 miles east of the eastern portion of the Eden Mining District. The majority of the historic mining areas are located approximately 6 miles west of the NRL.

History of Discovery, Exploration, and Mining. The Eden Mining District was reportedly discovered by John Adams in 1905. Little else is known about the discovery, exploration, and mining of the district.

Reportedly, there is on-going, small-scale mining at the 5 Jokers Mine by Mr. Neighbors and other family members (Ann Carpenter, 2004, personal communication).

Generalized Geologic Description. Tertiary ash-flow tuffs, welded to nonwelded, and some bedded air-fall tuffs are the host rocks for the ore deposits and underlie most of the mountainous terrain in the district. A large Tertiary intrusive mass forms the highest part of the Kawich Range. The ash-flow tuffs are commonly silicified and argillized in the vicinity of the workings, but the intrusive rocks are relatively fresh and exhibit a glassy margin. The northern Kawich Range is inferred to be a resurged caldron modified by basin and range faults (Ekren et al., 1976). The large intrusive body may represent a shallow part of an inferred magma system that existed beneath much of the northern Kawich Range and may have been responsible for the resurgence.

Northwest-trending lineaments, inferred to be faults, approximately coincide with the belt-like distribution of mines and prospects in the district. The northwest-trending features form a segment of the Kawich-Toiyabe lineament that continues northwestward for about 60 miles (Ekren et al., 1976).

Mineral/Energy Occurrences. The ore deposits consist of three mineralized zones (Ball, 1909). These mineralized zones vary from quartz veins to silicified rhyolite containing numerous quartz stringers. Gold occurs in quartz of a flinty variety, and silver as ruby silver, native silver, and hornsilver. A small amount of pyrite is present in the quartz and the altered rhyolite.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflicts between the NRL and the Eden Mining District based on the following:

- Relatively large distance separates the NRL and the historically mined and currently identified areas of mineralization in the district.
- Small, narrow, localized areas of mineralization.
- Controls to the mineralization, structure and stratigraphy, as currently identified, do not appear to trend toward the NRL.

- Possible drill roads in the area.
- Reported, small-scale mining at the 5 Jokers Mine at the time of the 2004 initial field reconnaissance, approximately 5 miles west of the NRL.

6.27 Reveille Valley Area (Plate ID No. 28)

Mining District or Area Name, Location, Map Reference Number. The Reveille Valley area includes the area along the western side of Reveille Valley, east of the southern end of the Kawich Range, and adjoins the northern boundary of the NTTR, referenced in this report as Plate ID No. 28 (Plate 1). The NRL is located approximately 1/2 to 2 miles east of the Reveille Valley area.

History of Discovery, Exploration, and Mining. According to Tingley et al. (1998), a shallow prospect pit is located in the center of a hydrothermally altered area, north of the NTTR boundary, and is evidence of historic prospecting activity, but the records reviewed did not indicate when this activity took place. The altered areas reportedly have been the site of exploration by several mining companies over the last 15 years (Tingley et al., 1998), most recently by Kennecott Exploration who held claims in the area in 1995 and conducted exploration drilling. Red Hawk Resources was conducting exploratory drilling in this area in mid- 2004 as observed during this initial field reconnaissance.

BLM Tonopah personnel indicated an area at the southern end of the Reveille Range where there was recent mining activity. Reportedly, there is some activity associated with some small mines in the area. This area appears to be within a designated Wilderness Study Area, and was not visited or further considered for this investigation.

During the initial field reconnaissance conducted in June 2004, drilling was observed in the Reveille Valley area on the pediment east of the Kawich Range. The area observed to be the site of drilling activities in June 2004 appears to correspond to the area described above by Tingley et al., (1998) and based on research, is referred to as the Alien Gold Project currently being explored for precious mineralization by Redhawk Resources, Inc.

The following information was obtained from the Redhawk Resources, Inc. website, which included the Alien Gold Project geologic report prepared by Mr. R. Joe Sandberg in September 2004. Reportedly, gold and silver mineralization at the Alien project is typical of volcanic hosted low-sulfidation, epithermal mineralizing systems. Precious metals are hosted in silicified zones, stockwork veins, and breccias developed along west-northwest, east-northeast and east-west trending structures. Mineralized zones are enveloped by successive argillic and propylitic alteration halos (Sandberg, 2004).

Exploration work at the Alien Gold project has been conducted since 1988 by the property owners, Pegasus Gold Corporation, Kennecott Exploration, and recently by Redhawk Resources, Inc. Early drilling and exploration focused upon finding near-surface, bulk-mineable, precious metal mineralization. Discovery of high-grade gold intervals (up to 31 g/t over 5 feet) within large, low-grade halos prompted more recent drilling efforts to locate high-grade gold and silver capable of supporting underground mining. Drilling prior to 2004 was all reverse circulation and totaled 35,345 feet in 58 holes. Exploration by Redhawk Resources, Inc. in 2004 included relogging of available drill cuttings, compilation and revaluation of data, commissioning of geophysical surveys (gradient array resistivity and spontaneous potential gradient surveys) over the Cap Structure discovery area, and drilling 5 core holes totaling 5,645 feet along approximately 1,200 feet of the Cap zone. The drilling confirmed the west-northwest trend and steep southwest dip of the Cap Structure, the presence of high gold grades (15.5 g/t gold over 4 feet in hole AC2) and long intervals of low gold grades. While not successful in finding a large body of high-grade gold, the core drilling confirms the presence of a large, multi-episodic, precious metal-bearing hydrothermal system (Redhawk Resources, Inc., 2004).

A two-phase exploration program is recommended for the Alien Gold project to consist of geologic mapping and additional geophysical coverage, followed by a second drilling exploration phase of 45,000 feet (Sandberg, 2004).

Redhawk Resources, Inc. has a 90-year lease agreement for the Alien Gold Project with private owners. To maintain the lease, Redhawk Resources, Inc. is required to make advance royalty payments, deliver 500,000 Redhawk shares, and spend $725,000 on the property over the first 6 years of the agreement (Redhawk Resources, Inc., 2004).

Generalized Geologic Description. The main area of alteration in the area consists of hydrothermally altered, welded ash-flow tuff, which outcrops on several small hills and in dry washes. The tuff outcrops are on a pediment surface and are surrounded by Quaternary alluvium. Several rotary drill holes, collared in alluvium, reportedly penetrated altered ash-flow tuffs at depths of 20 to 30 meters (Tingley et al., 1998).

The altered tuff has been widely argillized and silicified. Strongly silicified ledges grade outward into quartz-kaolin alteration and into areas of opalized tuff (Tingley et al., 1998).

Surface sample analysis (Tingley et al., 1998) and reported drill cutting analysis returned results indicative of high-level alteration in a high-sulfidation mineralizing system.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a medium potential for conflicts between the NRL and the Reveille Valley Area based on the following:

- The NRL is relatively close to the currently identified prospective areas.
- Unknown configuration and control of mineralization.
- Unknown trend of structures possibly controlling mineralization.
- Reported previous exploration programs by Pegasus Gold Corporation and Kennecott Exploration and a current minerals exploration program by Redhawk Resources, Inc., including drilling as observed during the June 2004 initial field reconnaissance (referred to as the Alien Gold Project).
- Surface sample analysis and reported drill cutting analysis returned results indicative of high-level alteration in a high-sulfidation mineralizing system (Tingley et al., 1998).
- Tingley et al. (1998) reported a moderate potential, certainty level B, for precious metal mineralization, for areas within the NTTR and in areas adjacent to the north of the NTTR.

6.28 Queen City Mining District (Plate ID No. 29)

Mining District or Area Name, Location, Map Reference Number. The Queen City Mining District, also known as the Black Hawk and Kawich District, is located in the low hills at the southern end of the Quinn Canyon Range near Queen City summit, referenced in this report as Plate ID No. 29 (Plate 1). The NRL is located approximately 2 miles north of the central portion of the Queen City Mining District.

History of Discovery, Exploration, and Mining. Mercury was discovered in the area in 1929. Between 1930 and 1960, about 80 flasks of mercury were produced, mainly from the Black Hawk Mine. In 1938, silver-mercury deposits were prospected at the Oswald Mine, located on the western edge of the district, and about 14 flasks of mercury are reported to have been produced from the property.

In 1983, a large part of the district was staked and prospected for disseminated gold (Tingley, 1984). Exploration for precious metals has continued intermittently and, in 1990, most of the eastern part of the district was staked by Kennecott Exploration Co. (Tingley, 1991). More recently, Pegasas Gold, Inc. was reportedly conducting exploration efforts in the area.

In October 2004, relatively recent mining claim posts, dated December 2003, referred to as the Blackhawk Claims, were observed during the initial field reconnaissance conducted in June and July 2004. The claims were identified as being staked by Beta Minerals USA, Inc., and had an Oregon address.

Based on information obtained from the Beta Minerals, Inc., website, Beta Minerals, Inc., control 100 percent interest in the 47 unpatented lode mining claims located in 2003 and 2004 that cover the Blackhawk property. Beta Minerals, Inc. reportedly conducted a rock and soil sampling program on the claims in the first half of 2004, with geological mapping and interpretation of the resulting anomalies planned for the fall

As indicated on their website, the Blackhawk property gold mineralization occurs within hydrothermally altered, silicified and brecciated limestone and volcanics along their faulted contact. The mineralization occurs along the faulted boundary between a volcanic caldera to the east, and folded selective jasperoid silicic replacement of limestone and calcareous shale of the Cambrian Windfall Formation forms stratabound gold-bearing zones within the folded and fractured sediments. The geological target model at the Blackhawk property reportedly is a disseminated Carlin style gold deposit similar to the Windfall Formation-hosted gold-silver mineralization seen at mines in the Eureka and other central Nevada mining districts. Drill targets are to be defined by Beta Minerals, Inc. based on results of their 2004 field program.

The following geologic information was also obtained from their website. Hydrothermal activity associated with flow domes along the ring fracture zone of the Tertiary caldera formed mercury-bearing, pipe-like breccia bodies on high angle faults with silicic replacement of the host rock and matrix-supported breccias. Silicic and iron-stained argillic alteration of limestone, shale, and sandstone units extend out into the formations and are cut by these northeast-southwest and east-west structures. At least one of these shears can be traced from the sediments to the northeast into the rhyolitic tuffs for a distance of over a mile and a half. The host rocks are cut by quartz-adularia veining within argillic altered shear zones in three common trends, north-south, northeast-southwest, and east-west. Mercury was discovered in the area in 1929 and sporadic production from several shafts and tunnels was made between then and the 1960s. Between 1983 and the early 1990s several companies conducted exploration drilling and geological investigations in the district, including Newmont Mining and Kennecott Exploration. Extensive jasperoid developed in the limestone is anomalous in gold (up to 1.2 grams per ton) and trace elements.

Generalized Geologic Description. The part of the Queen City District that hosts the ore bodies is underlain by the Oligocene Monotony Tuff, a major rhyolite ash-flow sheet containing abundant quartz phenocrysts.

Mineral/Energy Occurrences. The Monotony Tuff weathers to a brownish outcrop and has undergone very weak argillic alteration. Narrow silicified ribs have formed along north-trending fault zones in several wide-spaced areas. The widest of these zones is about 3 feet and consists of hairline quartz veinlets with brown limonite-after-pyrite.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflicts between the NRL and the Queen City Mining District based on the following:

- Apparent , small, narrow, localized areas of primarily mercury mineralization.
- In general, trends of structures controlling mineralization and favorable rock types do not appear to trend toward the NRL.
- Tingley et al. (1998) reported a low potential, certainty level C, for the discovery of silver-gold deposits for areas of the Queen City Mining District within the NTTR.

Previous and recent mining interest in the area.

6.29 Freiberg Mining District (Plate ID No. 30)

Mining District or Area Name, Location, Map Reference Number. The Freiberg Mining District, also known as the Worthington, Freyberg and Freiburg District, is located near the north end of the Worthington Mountains, referenced in this report as Plate ID No. 30 (Plate 1). The NRL is located approximately 1/2 mile north of the northern edge of the Freiberg Mining District. The vast majority of historic mining activity had occurred more than 3 miles south of the NRL.

History of Discovery, Exploration, and Mining. In 1865, a Native American showed the area to two prospectors, who then organized the Worthington district. In 1869, another prospecting party found ore-grade material and reorganized the district under the name Freiberg. The earliest record of production from the district was made in 1919, when small amounts of oxidized iron ore containing silver and lead was shipped from the roadside property. In 1921, one lot of lead-silver ore was shipped from an unnamed property (Lincoln, 1923). The total recorded production from the district is only $18,000 (Lincoln, 1923).

Indications of relatively recent mining and heap-leach activities were observed during the June-July 2004 initial field reconnaissance.

Generalized Geologic Description. The geology of the Freiberg Mining District consists of three structural elements, two of which are thrust sheets. The highest plate consists of west-dipping Ordovician rocks along the west side of the range south of the mineralized area. This plate has moved eastward over all the formations from the Pogonip Group in the mineralized area to the Scotty Wash Quartzite at the south end of the range. At the north tip of the range, the complexly faulted post-Pogonip rocks appear to be a remnant of a second thrust plate. The rocks beneath these plates, which contain the ore, constitute the third structural element. These rocks are intruded by two granite stocks and many granitic and lamprophyre dikes. Most of the limestone surrounding the stocks has been converted to marble or tactite, or it has been silicified.

Mineral/Energy Occurrences. The mineral deposits of the district are of two types: vein-like deposits of gold, silver, lead, and zinc; and scheelite deposits in tactite. Nearly all the production has come from small, irregular replacement lenses or veins along faults in limestone. Galena and pyrite are the only sulfides seen on the dumps. Most of the pyrite is oxidized and some deposits have well-developed gossan, which contains a green substance that resembles scorodite. These deposits include both gold veins and silver-lead veins.

The scheelite deposits are near the western flank of the range on the west edge of the granite stock. Scheelite is disseminated through a light-green tactite, which contains some wolframite.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflicts between the NRL and the Freiberg Mining District based on the following:

- Distance between the NRL and identified mineral resource areas of the district.
- Mines are generally in the southern end of the mining district and are small and localized replacement beds in limestone near an intrusive.
- Structural and lithologic controls to mineralization do not appear to trend toward the NRL.

6.30 Quinn Canyon – Sharp Mining Districts (Plate ID. Nos. 31 and 32)

Mining District or Area Name, Location, Map Reference Number. The Quinn Canyon Mining District, also known as the Willow Creek District, is located in the center and southeastern side of the Quinn Canyon Range, extends into Lincoln County, and is referenced in this report as Plate ID No. 31 and Plate ID No. 32 (Plate 1). The fluorite district, the Sharp Mining District on the east side of the range and the Willow Creek area on the western slope of the range, were included by Kral (1951) and others into a large Willow Creek District, which covered much of the southern Quinn Canyon Range. The NRL is located approximately 1/2 to 1 mile south of the southern edge of the Quinn Canyon Mining/Sharp Mining Districts. The vast majority of historic mining activity has occurred more than 4 to 6 miles north and northwest of the NRL. The largest fluorspar deposits in the state of Nevada occur in this mining district approximately 10 miles north and northwest of the NRL.

History of Discovery, Exploration, and Mining. Fluorite was discovered west of Cherry Creek in 1934. Other fluorite deposits were discovered to the west, near Quinn Canyon in 1941. Deposits to the south, in Lincoln County, were staked in the early 1950s (Papke, 1979). While only about 29,500 tons of fluorspar has been produced from the Quinn Canyon fluorite district, it contains the largest concentration of fluorspar deposits in Nevada (Papke, 1979).

Generalized Geologic Description. The Quinn Canyon Range consists mainly of thick sections of Tertiary rhyolitic and latitic ash-flow tuff. Locally, these volcanic rocks display propylitic and silicic alteration, as well as broad bands of brecciation where they are cut by northeast- to east-trending dikes. Two small outcrops of Devonian carbonate rocks occur in the area, one east of the range front in the valley between the Quinn Canyon Range and the Worthington Mountains, and another about 5 miles to the northwest.

Mineral/Energy Occurrences. The prospects in the area are associated with a northeast-trending zone of brecciation and silicification in volcanic rocks. Most of the prospecting activity appears to have been for optical quartz, but the area has no doubt been examined for fluorite. One prospect exposes a small area of skarn mineralization.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflicts between the NRL and the Quinn Canyon/Sharp Mining Districts based on the following:

- Distance between the NRL and historically mined and currently identified mineral resource areas of the district.
- The highest concentration of fluorspar deposits in Nevada are approximately 10 miles north-northwest of the NRL and trend approximately north-south, to the east of Quinn Canyon.

6.31 Oil and Gas Leases on the Western Side of Garden Valley (just North of the Frieberg Mining District) (Plate ID No. 33)

Mining District or Area Name, Location, Map Reference Number. This is an area of approximately 12 sections under oil and gas lease on the west side of Garden Valley, north of the Freiberg Mining District, referenced in this report as Plate ID No. 33 (Plate 1). The NRL traverses some of these oil and gas leases. An oil and gas well is surrounded by the leases.

History of Discovery, Exploration, and Mining. According to Allen Metscher, co-founder and co-curator of the Central Nevada museum in Tonopah, the oil and gas leases in this part of Nevada were likely speculative plays only, and occurred in the 1970s during the oil embargo and gas crisis. To the best of his knowledge, no activities resulted from these leases, and it is not clear why they still appear on the BLM LR2000 database.

Generalized Geologic Description. The oil and gas leases are located in an alluvial-filled valley, covering unknown bedrock.

Mineral/Energy Occurrences. Based on results of this investigation, it does not appear that there is information regarding mineral or energy resource occurrences for this area.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflicts between the NRL of the Yucca Mountain Project and the oil and gas lease area on the western side of Garden Valley. This low potential for conflict is based on the following:

- Apparent absence of obvious exploration activity on the leases.
- Leases are not located in a known oil and gas producing area.
- Leases surround a "dry hole" according to the Nevada Oil and Gas Well Map (Hess, 2001).

6.32 Heizer Sculpture/Landform Area (aka "The City" and GV3 (Plate ID No. 34)

Mining District or Area Name, Location, Map Reference Number. This area is in Garden Valley, west of the Golden Gate Range, near Cherry Creek. The three NRL alignments in this area are 2 miles north, 4 miles north, and 2 miles south of the Heizer sculpture area, referenced in this report as Plate ID No. 34 (Plate 1). Although this area is not a known mineral occurrence, project investigators visited these area during the June-July 2004 initial field reconnaissance, and again in April 2005 to generally assess alternate alignment GV3, at the request of BSC (Appendix).

History of Discovery, Exploration, and Mining. Not applicable.

Generalized Geologic Description. Not applicable.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for mineral occurrence-related conflicts between the NRL and the Heizer Sculpture Area. It is likely conflicts may exist with regard to private party ownership, the view shed, and other issues.

6.33 Golden Gate Range (Oil and Gas Lease Area) (Plate ID No. 35)

Mining District or Area Name, Location, Map Reference Number. An earlier BLM LR2000 database indicated an area of approximately two sections under oil and gas lease and located in the Golden Gate Range just west of Coal Valley, referenced in this report as (Plate ID No. 35) (Plate 1). The NRL traverses some of these earlier identified oil and gas leases. These leases did not appear on the subsequent September 2004 database.

History of Discovery, Exploration, and Mining. According to Allen Metscher, co-founder and co-curator of the Central Nevada Museum in Tonopah, the oil and gas leases in this part of Nevada were likely speculative plays only and occurred in the 1970s during the oil embargo and gas crisis. To the best of his knowledge, no activities resulted from these leases and it is not clear why they still appear on the BLM LR2000 database.

Generalized Geologic Description. The northeasterly-trending Golden Gate Range comprises mainly Paleozoic sedimentary rocks, which are overlain by Tertiary and Quaternary volcanics.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflicts between the NRL and the oil and gas leases in the Golden Gate Range based on the following:

- Apparent absence of obvious exploration activity on the leases.
- Leases are on the western flank of Coal Valley, an area with previous oil and gas exploration.
- Apparent absence of exploration or other activity on the leases.

6.34 North End of the Seaman Range Mining District -Timber Pass Area (Plate ID No. 36)

Mining District or Area Name, Location, Map Reference Number. The Seaman Range Mining District lies between Coal Valley and White River Valley in Lincoln and Nye Counties, referenced in this report as Plate ID No. 36 (Plate 1). The NRL traverses the northernmost portion of the Seaman Range Mining District. The vast majority of historic mining activity occurred more than 3 miles south and southwest of the NRL.

History of Discovery, Exploration, and Mining. Very little mining activity is in evidence in the Seaman Range. The Red Head claims, on the west side of the range, have been held by the Davies family since 1939 and, during the 1940s and 1950s, minor amounts of mercury were produced from the property (Gese and Harris, 1985). On the northeast tip of the range, workings on the FNB claims appear to date from the 1920s or 1930s, but there has been no activity there for many years (Gese and Harris, 1985).

In 1955, Lincoln Uranium Co. was working on the Lucky Strike claim on the northwestern flank of the range, possibly in the same general area as the Red Head claims. They are reported to have drilled 11 holes totaling 647 feet (Garside, 1973). In the 1960s, Bear Creek Mining Co. carried out exploration work in the Timber Mountain Pass area (Gese and Harris, 1985).

The Seaman Range attracted interest for its disseminated gold potential early in the 1980s, and several large claim blocks were staked along the western edge of the range. Reportedly in 1990, many areas were still being held by mining companies (Tingley, 1991).

Numerous, presumably older (white PVC) claim posts were observed in the Timber Mountain Pass area at the north end of the Seaman Range during the initial field reconnaissance.

Generalized Geologic Description. The northern end of the Seaman Range is underlain by a thick sequence of Paleozoic rocks ranging from Silurian Laketown Dolomite to the Mississippian Joana Limestone and Chainman Shale. These rocks are overlain on the southwest by extensive, intermediate to silicic ash-flow sheets. The northernmost part of a small volcanic center crops out in the west-central part of the range, south of most of the prospecting areas. Several sets of normal faults cut the Paleozoic rocks; both the carbonate rocks and the volcanic rocks generally strike northwest and dip southwest.

Mineral/Energy Occurrences. Most of the prospecting activity along the west side of the Seaman Range has been carried out on large ledges of jasperoid, which have formed in the carbonate rocks along northwest-trending faults.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflict between the NRL and the Seaman Range Mining District based on the following:

- Readily available data suggests minimal mineral development activity (or an absence of data) is evident in this area.
- Notice of Intents have been filed on two sections of land in this area.

6.35 Oil and Gas Lease Area, Northeast of Fox Mountain, at the North End of the Seaman Range (Plate ID No. 37)

Mining District or Area Name, Location, Map Reference Number. An area of approximately 11 sections under oil and gas lease is located in the small valley northeast of Fox Mountain, referenced in this report as Plate ID No. 37 (Plate 1). The NRL is approximately 7 miles southeast of these leases.

History of Discovery, Exploration, and Mining. According to Allen Metscher, co-founder and co-curator of the Central Nevada museum in Tonopah, the oil and gas leases in this part of Nevada were likely speculative plays only and occurred in the 1970s during the oil embargo and gas crisis. To the best of his knowledge, no activities resulted from these leases, and it is not clear why they still appear on the BLM LR2000 database.

Generalized Geologic Description. The northeasterly trending Fox Mountain comprises mainly Paleozoic sedimentary rock, which are overlain by Tertiary and Quaternary volcanics.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflicts between the NRL and the oil and gas leases in area northeast of Fox Mountain based on the following:

- Apparent absence of obvious exploration activity on the leases.
- Distance (approximately 7 miles) between these leases and the NRL.

6.36 Comet Mining District (Plate ID No. 38)

Mining District or Area Name, Location, Map Reference Number. The Comet Mining District extends along the west side of the Highland Range, adjoins the Highland District on the north and east, adjoins the Ely Springs District on the west, is about 10 miles west of Pioche, referenced in this report as Plate ID No. 38. The NRL is located approximately 4 miles south of the southern edge of the Comet Mining District.

History of Discovery, Exploration, and Mining. The ores of the Comet Mining District were discovered in 1882 (Lincoln, 1923), but production prior to 1895 is unknown. Silver-lead ore containing small amounts of gold and copper was shipped intermittently from the district between 1895 and 1898 and between 1913 and 1920. Most of this early production came from the Schodde mine, which is reported to have produced about $125,000 during World War I (Lincoln, 1923).

The Comet mine was relocated in 1906 and, although additional claims were staked in 1913, production before 1924 is not recorded. Silver, lead, zinc, gold, and tungsten were produced from oxidized ore in the Comet mine between 1925 and 1950. Between 1945 and 1951, 13,700 tons of sulfide ore were mined. Between 1947 and 1955, about 17,000 tons of low-grade manganese ore containing small amounts of silver, lead, and zinc from the Pan American were mined and milled for metallurgical testing. The total estimated value of the metals mined from the district is $764,100 (Tschanz and Pampeyan, 1970).

Relatively recent mining claims were observed to have been staked in a section south of the main mining district during this initial field reconnaissance.

Generalized Geologic Description. The Highland Range consists of two structural elements. The first is the simple east-tilted fault block, which makes up the main part of the range. This block, which has the oldest rocks exposed along the west side, has apparently been overridden by the second structural element, the Highland thrust plate. This thrust plate is composed largely of Upper Cambrian rocks, probably the Mendha Limestone.

The geology of the Comet Mining District is fairly straightforward. The mineral deposits occur in the Prospect Mountain Quartzite, Pioche Shale, and Lyndon Limestone below the Highland thrust plate. Four veins, the largest of which is developed by the Comet mine, cut the quartzite and shale. These veins strike about N 60 W, dip nearly vertical, are as wide as 13 feet, and can be traced for about 1,400 feet. Fissures in the limestone at the Schodde mine have the same general strike and are parallel to several irregular lamprophyre dikes, which contain some galena (Westgate and Knopf, 1932).

Mineral/Energy Occurrences. Quartz veins and bedded replacement deposits occur in the district. The primary ore in the quartz veins, principally the Comet vein, contains galena, sphalerite, pyrite, wolframite, scheelite, argentite, and gold. The oxidized ore contains plumbojarosite, cerrusite, and limonite. The Comet vein averages 6 feet in width and contains 4 ore shoots in the wider parts. A parallel fissure several hundred feet north of the Comet vein is reported to contain as much as 1.4 percent tungstate oxide (WO_3).

Bedded replacement deposits, 10 to 15 feet thick, occur in the lower part of the Combined Metals Member of the Pioche Shale at the Pan American mine and in or near the base of the Lyndon Limestone at the Schodde mine. The primary ore contains pyrite, sphalerite, argentiferous galena, and manganosiderite similar to the bedded replacement ore in the Pioche Mining District.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflicts between the NRL and the Comet Mining District based on the following:

- Distance (approximately 4 to 6 miles) between the NRL and historically mined and currently identified mineral resources in the district.
- Extensions of the types of mineralization at the mining district appear to generally trend toward the NRL.
- The extent and strength of quartz veins and localized bedded replacement deposits is unknown.

6.37 Bennett Pass Area (Plate ID No. 39)

Mining District or Area Name, Location, Map Reference Number. The Bennett Pass area adjoins the southern end of the Highland Range to the north and the northern end of the Chief Range to the south, is about 10 miles west of Pioche, referenced in this report as Plate ID No. 39 (Plate 1). The NRL traverses the Bennett Pass area.

History of Discovery, Exploration, and Mining. The Bennett Pass area reportedly contains a recent "significant" paleontological study area. According to Barbara Rohde, park interpreter at Cathedral Gorge State Park, the area is a possible trilobite extinction boundary site near Ruin Canyon and has been withdrawn by the BLM as a paleontological/geologic study area.

A carbonate rock deposit is identified on Map 142 (Caselton, map code 10), NBMG (2003). It is identified as having "active or significant past production." The location of this deposit, according to that map, is approximately 1 mile north of the NRL. The limestone quarry visited during this initial field reconnaissance corresponds to this carbonate rock deposit.

A warm spring near Bennett Pass is identified on Map 141, NBMG (2003). It is identified as Bennett Springs with thermal waters ≤ 37 degrees C. The location of this spring, according to that map, is approximately 1 mile northeast of the NRL.

Generalized Geologic Description. The Highland Range consists of two structural elements. The first is the simple, east-tilted fault block, which makes up the main part of the range. This block, which has the oldest rocks exposed along the west side, has apparently been overridden by the second structural element, the Highland thrust plate. This thrust plate is composed largely of Upper Cambrian rocks, probably the Mendha Limestone.

The Bennett Pass area is located in a small low pass made of low alluvial covered hills with localized outcrops of sedimentary rocks, which host the fossils. Based on information provided by BSC, Ely BLM personnel indicated that the paleontologic site near Benett Pass is referred to as the Ruin Wash site. Reportedly, this site is about 3 to 5 miles south of the segregated lands associated with the NRL. Reportedly, he did not have express concerns about impacts of the NRL on the location and noted that the paleontological site is important because there are few surface exposures of the formation. The formation and the bed containing the fossils are believed to underlie an extensive area; they just are not typically exposed at the ground surface.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low to medium potential for conflicts between the NRL and the Bennett Pass area based on the following:

- Close proximity of a limestone quarry and geothermal resources.
- "Significant" paleontological site is currently being studied by various universities and paleontology professionals/experts; however, the site reportedly is located 3 to 5 miles south of the NRL.

6.38 Chief Mining District (Plate ID No. 40)

Mining District or Area Name, Location, Map Reference Number. The Chief Mining District, also known as the Caliente Mining District, is located on the east slope of the Chief Range, is about 5 miles due north of Caliente, and is referenced in this report as Plate ID No 40 (Plate 1). The NRL is located approximately 2 miles north of the northern edge of the Chief Mining District and 1 mile east of the southwestern spur of the NRL.

History of Discovery, Exploration, and Mining. The ore deposits in the Chief Mining District were probably discovered in 1868 shortly after the initial discoveries near Pioche. The district was organized in 1870 (Lincoln, 1923), and the Black Hawk ledge was worked by Raymond and Co. in 1871 and 1872. The district was inactive in 1875 and 1876, but 293 tons of ore were shipped to Bullionville near Panaca in 1896.

The next recorded activity was in 1907, and intermittent small-scale operations continued to about 1953. The total production from the district is only about $88,000 (Tschanz and Pampeyan, 1970).

Generalized Geologic Description. The Chief Range is composed largely of Prospect Mountain Quartzite, which strikes northwest and dips about 25 degrees northeast. The Pioche Shale, Lyndon Limestone, and Chisholm Shale are faulted out by major thrust faulting in the Chief district where an Upper Cambrian unfossiliferous limestone and dolomite unit rests in fault contact on the quartzite. The limestone and dolomite unit is partly metamorphosed by the intrusion of dikes, sills, and plugs or diorite porphyry.

Breccia zones are present between the thrust plate of limestone and quartzite, range from 10 to 40 feet thick, and are generally cemented by mylonitic material and iron oxides or by quartz and other vein materials. Ore bodies occur in these breccia zones or in the quartzite as veins that generally strike N 15 to 20 degrees W (Tschanz and Pampeyan, 1970).

Mineral/Energy Occurrences. The mineral deposits are in fissure veins in the quartzite or in the breccia zones between quartzite and the over-thrust carbonate rock. Some replacement of the quartzite and limestone and dolomite wallrocks has occurred along the fissures.

The principal metals are gold, silver, and lead. All the ore is oxidized, and galena is the only residual sulfide. Three types of veins, distinguished by their constituents, exist in the district (Tschanz and Pampeyan, 1970).

The type of vein that has the highest content of gold and silver is the arsenian type, like the veins in the Advance, Old Democrat, and Lucky Hobo mines. The ore is a massive, greenish to brownish, vuggy aggregate or arsenopyrite replaced by scorodite, which is in turn replaced by a micaceous mineral. Jarosite, descloizite, cerrusite, mimetite, and beudanite are also present.

The second and most productive type of vein is the nonarsenian type that occurs in the Gold Chief mine in thrust fault breccia. The vein filling is a network of tabular barite crystals and scattered grains of galena. Colliform chalcedonic quartz replaces and veins the barite. Quartz, hemomorphite, mimetite, and manganese and iron oxides fill the interstices between the barite crystals in the ore. The gold and silver content of this type of vein is low.

The third type of vein forms the principal lead deposits. The veins include a pipelike ore body in the Republic mine and an irregular cerrusite body in the Lucky Chief mine. The ore from the Lucky Chief consists of grains and nodules of cerrusite, powdery opal, plumbojarosite, and lumps of iron and manganese oxides in fine-grained quartz.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflicts between the NRL and the Chief Mining District based on the following:

- Known mineral occurrences are located along the eastern side of the Chief Mountains, approximately 2 to 3 miles west of the western segment of the NRL.
- Most gold, silver, and lead mineralization occurs in fissure veins in quartzite or in the breccia zones or small replacement deposits that do not appear to trend toward the NRL.
- Small recorded production from the mining district.

6.39 Pozzolan Placer Area (Plate ID No. 41)

Mining District or Area Name, Location, Map Reference Number. The Pozzolan Placer area is located approximately 4 miles south of Pioche and north of Cathedral Gorge State Park, west of Highway 93 and east of the Highland Range, referenced in this report as Plate ID No. 41 (Plate 1). The Pozzolan Placer area, at its closest, is 2 miles northeast of the NRL.

According to BLM personnel, industrial minerals are often claimed by placer claims. They indicated that pozollon is considered a "specialty material" and therefore, locatable. According to the BLM LR2000 database, there are approximately 22 sections of land containing placer claims.

History of Discovery, Exploration, and Mining. Based on this investigation, there does not appear to be information regarding the history of the discovery, exploration, and mining in the area.

Generalized Geologic Description. The Pozzolan Placer Area consists of low volcanic hills with a thin veneer of alluvium and colluvium cover over Tertiary lakebed sediments and volcanic rocks.

Mineral/Energy Occurrences. Portions of the Tertiary lakebed sediments consist of pozzolan, a silicious material such as diatomaceous earth, opaline chert, and certain silica-rich tuffs, which can be finely ground and combined with cement to increase the strengthening properties. The pozzolan reacts with calcium hydroxide that is liberated when concrete hardens. Portland-Pozzolan cements are highly resistant to penetration and corrosion by saltwater (Dictionary of Geologic Terms, 1984).

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low to medium potential for conflicts between the NRL and the Pozzolan Placer Area based on the following:

- Distance (approximately 2 to 4 miles) between the NRL and historically mined and currently identified areas of mineral resources in the district (low).
- Unknown extent of pozzolan material.
- Possibility of related resources (silica, clay) in the area.

6.40 Panaca Area (Plate ID Nos. 42, 43, and 44)

Mining District or Area Name, Location, Map Reference Number. The Panaca Area is located east of Panaca and is referenced in this report as Plate ID Nos. 42, 43, and 44) (Plate 1). Location 42 is the diatomite deposit approximately 0.5 mile east of Panaca, approximately 4 miles north of the crestline alignment of the NRL. Location 43 includes two sections of land in which Plans of Operations have been filed according to the BLM's LR2000 database. Location 43 is located approximately 2 miles north of the crestline alignment of the NRL. Location 44 comprises four, noncontiguous sections in which both Plans of Operation and Notices of Intent filed according to the BLM LR2000 database. This area is located approximately 1 mile northeast and southwest of the NRL.

History of Discovery, Exploration, and Mining. A description of the early history of the diatomite deposits in the district was not identified in the published literature. A deposit located a short distance east of Panaca was developed in 1959 by Morgan and Bush, Inc., who operated a small plant in Panaca. The total production from this deposit is not known, but 512 tons of rock, worth $15.39 per ton, were shipped in 1952. The above-mentioned deposit and quarry were observed to be inactive during this initial field reconnaissance.

Areas in the eastern and southeastern portions of the Panaca area contain locations where either Plans of Operation or Notices of Intent to Operate have been filed according to the BLM LR2000 database. These areas were visited during the initial field reconnaissance; however, features indicating activity were not observed.

Generalized Geologic Description. Diatomite is widely distributed in the intravolcanic sedimentary rocks and in the lakebeds, but the only deposit that has been developed is contained within the Panaca Formation. These rocks consist to a great extent of siltstone and clay shale, but are not the lacustrine limestone of the Miocene age. The older lakebeds rest unconformably on all underlying rocks, but are in part equivalent to the thick tuff sequence of the Oak Spring Group.

The lacustrine formations consist of white, pale-gray-green, light brown, and terra-cotta gravel, sand, silt, and clay. The coarse grained sediments seldom have a gradation larger than coarse sand and consist mostly of volcanic debris and fragments derived from the nearby Paleozoic rocks. In most instances, the predominant formation consists of finer-grained sediments, chiefly water-lain tuffs or tuffaceous rocks. Beds of marly limestone are often present, and thin white beds of either diatomite or pure volcanic ash are present near the town of Panaca. Porcelaneous opal-cemented tuff in thin layers and concretions also occur in the butte near the town of Panaca.

Mineral/Energy Occurrences. East of Panaca, a bed of diatomite 6 to 10 feet thick, crops out from beneath 22 to 40 feet of overburden for 2,300 feet along strike.

Uranium and titanium occurrences are reported in the area (Garside, 1973; and Tingley et al., 1998). Carnotite occurs in tuffaceous lakebeds of the Pliocene Panaca Formation.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low to medium potential for conflicts between the NRL and the Panaca Area based on the following:

- Proximity to the NRL of potential resources in the general area such as perlite and diatomaceous earth.
- Notices of Intent and Plans of Operation filings indicative of recent mineral development activity.
- Unknown extent of potential mineral resources in the area.
- Apparent low recorded diatomaceous earth production for the area.

6.41 Little Mountain Mining District (Plate ID No. 45)

Mining District or Area Name, Location, Map Reference Number. The Little Mountain Mining District, also known as the Cinnamon Bear Mining District, is located in the Cedar Range about 12 miles southeast of Panaca and is referenced in this report as Plate ID No. 45 (Plate 1). The NRL is located approximately 4 miles north of the northern edge of the Little Mountain Mining District. It appears that the reported copper mineral occurrence is located about 6 miles east and south of the alignment.

History of Discovery, Exploration, and Mining. Information regarding the history of discovery, exploration, and mining in this district was not identified during this investigation.

Generalized Geologic Description. The Little Mountain Mining District is in an area underlain by both intrusive and extrusive rocks, and also a small amount of sedimentary rock. The oldest formations consist of Cambrian limestone, which is exposed at the north end of the district. They are unconformably overlain by andesitic volcanic rocks and contain an intrusion consisting of a Tertiary diorite or monzoniotic porphyry stock. The andesitic rocks and the stock are both themselves cut by a small granite stock and by several aplitic dikes. The dikes can be up to 80 feet thick. Rhyolitic volcanic rocks overlie the diorite, and the aplite dikes are probably feeders for the overlying volcanic rocks (Tschanz and Pampeyan, 1970).

Mineral/Energy Occurrences. All of the mineral deposits occur in or near the intrusive stock. Through an area of about 2 square miles, there are many prospect pits exposing copper stained rocks but no visible sulfides. These prospect pits are scattered along altered, but often poorly defined, shear zones. Several prospects, including the Aztec, are in the andesites at the diorite contact (Tschanz and Pampeyan, 1970).

The only visible ore minerals in most prospect pits consist of small amounts of malachite and chrysocolla. The copper must occur to a great extent, as black chalcocite or tennorite, because even rock with little copper stain or visible sulfides is reported to contain an average of around 1.5 to 2.0 percent copper and may contain as much as 4 percent copper. The highest reported silver content was 14 ounces per ton (Tschanz and Pampeyan, 1970).

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflicts between the NRL and the Little Mountain Mining District based on the following:

- Relatively large distance (approximately 4 miles) between the NRL and reported mineral occurrences in the district.
- Small, localized areas of mineralization associated with an intrusive stock.
- Low likelihood that the mineralization extends to the NRL.

6.42 Caliente Area (Plate ID No. 46)

Mining District or Area Name, Location, Map Reference Number. The Caliente area includes the northern portion and flanks of the Clover Mountains south and southeast of Caliente, the area northwest of Caliente, in Antelope Canyon, and the town of Caliente and is referenced in this report as Plate ID No. 46 (Plate 4). Various potential resources occur in this area and are located approximately 0.5 to 2 miles from the NRL.

History of Discovery, Exploration, and Mining. According to NBMG Bulletin 73, a quartzite quarry approximately one mile north of Caliente in Antelope Canyon was the largest operating quarry in Lincoln County (M4-12-FD1). The quarry was served by a railroad spur of the Union Pacific Railroad, and reportedly produced ballast for the railroad and aggregate for contractors working on local construction projects. This quarry was observed during the initial field reconnaissance but appears not to be in operation. Further down Antelope Canyon, to the southeast is what may be a surface mining operation within the main wash (M4-12-FD2). This mining operation was observed to be active when visited in June 2004.

Zeolite deposits are identified on Map 142 NBMG (2003) (Caliente, map code 15) as having "no significant past production." According to that map, the location of this deposit is approximately 1 mile south of the NRL, at the proposed interface between the NRL and the UPRR at Caliente. The location of this zeolite deposit was not identified during this initial field reconnaissance.

According to NBMG, Bulletin 73, perlite deposits are a major resource in Lincoln County, which usually ranks first in Nevada in production. Perlite, a term, which includes all expandable volcanic glass, was first produced on a commercial scale in 1948. In 1949 and 1950, Lincoln County accounted for about half of the national perlite production, and the county has remained a major producer of perlite since that time. Many large deposits of commercial quality are known, and it is likely more will be found. A report from Union Pacific Railroad in 1951 estimated that the reserves of 10 perlite deposits in Lincoln County totaled about 180,400,000 tons. NBMG Bulletin 73, indicated the presence of large, undeveloped deposits not previously described in the 1951 report and, therefore, subsequent estimates are higher. Restricted access was encountered during the June-July 2004 initial field reconnaissance, and these deposits were not observed.

One hot spring (> 37 degrees C) and one hot well (> 37 degrees C) are identified on Map 141, NBMG (2003). They are identified as Caliente Hot Springs and are listed as a direct use applicator of the geothermal resources. A commercial hotel and spa use the geothermal resources for pool, spa, and space heating.

Generalized Geologic Description. The rocks contained in the portion of the Caliente Area northwest of Caliente primarily consists of the Prospect Mountain Quartzite. The area is also generally underlain by Cambrian rocks and Tertiary volcanic rocks. It is likely that the Upper Cambrian rocks, which include limestone, quartzite, and dolomite, are part of the Highland thrust plate that appears to have overridden the volcanic rocks.

The entire mass of the Clover Mountains is composed of volcanic rocks, except for a few scattered areas of structurally complex pre-Tertiary sedimentary rocks, which were faulted before the volcanic activity. Faulted Cambrian sedimentary rocks and dioritic intrusive rocks are exposed in the Pennsylvania Mining District. Cobble conglomerate and lacustrine limestone of Tertiary or Cretaceous Age crop out from beneath the volcanic rocks in some areas. Permian, Triassic, and Carboniferous rocks are exposed in other areas.

The structure of the Tertiary rocks is largely unknown, but it appears to be comparatively simple. South and east of Caliente, the younger volcanic rocks consist of about 600 feet of interbedded white tuffaceous rocks and thin rhyolite flows and welded tuffs. The basal unit rests unconformably on the older volcanic rocks, and is a reddish or pink scoriaceous rhyolite, 80 feet thick that is altered along faults to chalky white clays and alunite. The tuffaceous rocks in the sequence partially consist of partly water-lain sediments and partially of massive air-fall or flow deposits.

Perlite or perlitic flows occur locally near the top of the sequence. This entire ignimbrite series may have been extruded from vents near Boyd, about 15 miles south of Caliente, where a major complex dike-flow unit of platy rhyolite formed late in the series.

Mineral/Energy Occurrences. Two adjacent perlite deposits are probably parts of a single flat-lying mass, which overlies a rhyolite flow. The Minto deposit is 60 feet thick and the Eccles deposit is 150 feet thick.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a medium potential for conflicts between the NRL and the Caliente Area. This medium potential for conflict is based on the following:

- The proximity of perlite, zeolite, quartzite, and geothermal occurrences in the area of the NRL.
- Current direct application of geothermal resources.

6.43 Montezuma Mining District (Plate ID No. 47)

Mining District or Area Name, Location, Map Reference Number. The Montezuma Mining District is located on the northern end of the Montezuma Range, approximately 7 miles west of the town of Goldfield, Nevada in eastern Esmeralda County, referenced in this report as Plate ID

No. 47 (Plate 1). The proposed NRL segment GF4 is located approximately 2 miles east of the eastern edge of the Montezuma Mining District. The majority of the mine workings associated with this mining ditrict is located approximately 5 to 6 miles west of the proposed NRL, on the western flanks of the Montezuma Range.

History of Discovery, Exploration, and Mining. The Montezuma Mining District was discovered by Nagle, Carlyle, and Plunkett in May 24, 1867, and the district was organized shortly thereafter. A 10-stamp mill was brought from Yankee Blade to Montezuma in 1870 but only operated for about 4 months. The district continued active until 1887, up to which time it produced about $500,000 mainly in silver, but with some gold. In 1905, the district, was again prospected, and since then was making small intermittent shipments up until 1923 (Lincoln, 1923).

Generalized Geologic Description. Cambrian limestones, shales, and quartzites make up the principal mass of the Montezuma Hills. They have been intruded by granite, quartz-monzonite, and diorite; and are capped in places by Tertiary volcanic rocks and interbedded Siebert lakebeds (Albers and Stewart, 1972).

Mineral/Energy Occurrences. The principal ore mined in the district was silver ore. The ore bodies in the silver-lead portion of the district consist of veins in limestone and shale and replacements in limestone and are predominantly in the Lower Cambrian Poleta Formation, and to a lesser extent, in the Precambrian Reed Dolomite. The gangue is chiefly quartz. The district is cut by a few felsic and mafic dikes that appear to have no relation to the ore bodies.

Ore minerals at the surface include cerusite, copper, malachite, azurite, manganese oxide, and limonite. At depth the ore minerals include galena, chalcocite, and pyrite. A mercury prospect occurs in the southern part of the district. The deposit is of the opalite type in silicic. Tertiary, air-fall tuff, slightly faulted against the Deep Spring Formation. The faulted contact strikes about north 60 degrees west and dips about 30 degrees southwest locally paralleling the dip of the tuff to form a rib of opalite, approximately 450 feet long and 30 feet wide at the surface. Cinnabar is disseminated in the unsilicified tuff beds and in the opalite near the fault contact (Albers and Stewart, 1972).

A commercial/recreational gemstone collecting area is located in the Gemfield portion of the district, approximately three miles west of U.S. Highway 95. Relatively large, northeast-southwest trending outcrops of iron-stained chalcedonic quartz have been quarried and collected, on a honor-based fee system for many years. A green common opalite, locally referred to as "Nevada jade," is also collected in this area. The northern portion of the GF5 alignment traverses the land between the gemstone collecting area and U.S. Highway 95.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflicts between the NRL and the Montezuma Mining District based on the following:

- Distance between the NRL and the majority of mine workings in the district is approximately 5 to 6 miles.
- Relatively narrow and localized silver and lead mineralization (veins in fractures and replacement deposits).
- Structures controlling mineralization and favorable rock types do not appear to trend toward the NRL.
- Apparent low potential for sand and gravel and other construction materials in the area on the east flank of the Montezuma Range.

6.44 North and East Reveille Area (SR4) (Plate ID No. 48)

Mining District or Area Name, Location, Map Reference Number. Proposed alternate alignment SR4 begins near the intersection of U.S. Highway 6 and Nevada State Highway 375 near Warm Springs and traverses east across Hot Creek Valley, roughly paralleling Nevada State Highway 375, for approximately 10 miles. Alignment SR4 then passes through a small valley between the northern end of the Reveille Range and the southern end of the Pancake Range, then turns south and traverses the eastern flank of the Reveille Range along the western edge of Railroad Valley. South of Fred's Well, SR4 turns and continues east to a location near the southern end of the Quinn Canyon Range. This area is referenced in this report as Plate ID No. 48 (Plate 1).

History of Discovery, Exploration, and Mining. Based on results of this investigation, information relative to the history of discovery, exploration, and mining does not appear to exist for this area.

Based on the April 2005 site reconnaissance, there appears to be relatively recent activity in the area based on the several white PVC claim posts observed in the area south of Nevada State

Highway 375 near Twin Springs Ranch. The claim posts did not have any information on them, such as claim notices.

Generalized Geologic Description. The generalized regional geology and stratigraphy can be assumed to be similar to that of the Reveille Mining District (Section 6.25). Paleozoic and Tertiary rocks underlie the Reveille Mining District, and in contrast to many other districts in northern Nye County, the stratigraphy and structures of the Tertiary rocks appears to be more complex than the stratigraphy and structure of the Paleozoic rocks.

The exposed Paleozoic section consists of about 4,700 feet of sedimentary strata. Basal exposures consist of the upper part of the Antelope Valley Limestone (part of the Pogonip Group) and are overlain by other formations of the eastern Nevada carbonate assemblage.

The Tertiary volcanic rocks in this area generally either lie unconformably on or are faulted against Paleozoic rocks. They consist of welded ash-flow tuffs and lavas as well as lesser amounts of air-fall tuffs, tuffaceous sedimentary strata, and debris beds, including landslide material. Tertiary dikes and sills are also present. Most of the exposed dikes, sills, and other miscellaneous intrusive bodies cut across other Tertiary rocks; however, several cut across the exposed Paleozoic strata. The composite Tertiary section totals about 13,000 feet in thickness. Drastically different thicknesses of the Tertiary section occurs from place to place, but at any one locality the section is generally no more than a few thousand feet thick. The drastic thickness changes are probably due to the lenticular nature of deposition and later erosional removal of material.

The northern half of the Reveille Range consists essentially of a gently westerly tilting core block of Paleozoic strata that is broken into a separate megamosaic and that is also bounded on all sides by faults. The faults separate the Paleozoic core from the generally less intensely, but yet complexly, faulted Tertiary rocks. The faults within the core block are inferred to be mainly normal faults related to basin-and-range tectonism. The structures in the Tertiary rocks appear to be related to volcanism that was later modified by the typical normal faulting associated with basin-and-range tectonism (Kleinhampl and Ziony, 1985).

Mineral/Energy Occurrences. Based on results of this investigation, information regarding mineral occurrences does not appear to exist for this area.

During the April 2005 initial field reconnaissance, small outcrops and knobs of silicified and iron stained rhyolite were observed in the pass near the Twin Springs Ranch. One small prospect pit that was observed exposed a 30- to 40-foot-wide silicified zone that was traceable for a length of approximately 1/2 mile. The host rocks for this zone consist of rhyolite and rhyolitic tuff.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflicts between this alternate alignment and the areas observed based on the following:

- Apparent absence of documented mineral resources in the area.
- Presence of only small, weakly developed zones of rock alteration, which were observed in only one isolated area.
- Relatively little claim staking activity.
- Structures controlling mineralization and favorable rock types do not appear to trend toward the NRL.
- Apparent low potential for sand and gravel and other construction materials.

6.45 Golden Gate Mining District (GV4) (Plate ID. No. 49)

Mining District or Area Name, Location, Map Reference Number. The Golden Gate Mining District, is located in the Golden Gate Range, between Garden Valley and Coal Valley, in Lincoln County. This small district was named for just one mine located in the southeastern end of the range and is referenced in this report as Plate ID No 49 (Plate 1). Proposed alternate alignment GV4 begins at the northern tip of the Worthington Mountains; then continues south through a portion of Garden Valley, west of the Golden Gate Range; and then through Murphy Gap. The alignment, then continues north on the east side of the Golden Gate Range, on the west side of Coal Valley, to Water Gap (Plate 1). The Golden Gate Mining District is located approximately 2 to 3 miles west of this proposed alternate alignment.

History of Discovery, Exploration, and Mining. Information regarding the mining history of the area is not available and was not identified during this investigation.

During the April 2005 initial field reconnaissance, 4-inch by 4-inch wooden claim posts were observed in this area. Debris and machinery parts scattered about the mine site suggested that the latest mining-related activities probably occurred in the 1950s. Shafts at the site were observed to be shallow and probably produced little, if any, ore. Parts of a drill tripod, drilling cement, and rock core fragments scattered about the area indicate that surface diamond drilling was probably conducted in the past. Based on site observations and the core fragments, core drilling may have consisted of a single AX-sized hole.

Generalized Geologic Description. The eastern Golden Gate Range consists of a westward-tilting block of Paleozoic rocks. These rocks include the Guilmette Formation, Pilot Shale, Mississippian limestone, Chainman Shale, Scotty Wash Quartzite, and Pennsylvanian limestone and sandstone (Tingley, 1991).

The oldest rocks form the steep eastern face of the range, which is thought to be bounded by a normal fault, the Golden Gate fault (Tschanz and Pampeyan, 1970). The Pahranagat Range thrust plate is interpreted to extend north into the Golden Gate Range. The boundary of this plate, which contains Ordivician, Silurian, and Devonian age rocks that are thrust over Devonian and Mississippian age rocks, passes along the east side of the range slightly west of the workings.

Mineral/Energy Occurrences. Shallow shafts were observed during the field reconnaissance along an east-striking jasperoid-gossan lens contained in a gray, cherty, fossiliferous limestone. Where it is exposed in the shafts, the jasper-gossan zone strikes generally east-west, dips approximately 80 degrees south, and is about 15 to 20 feet wide.

In the same area, upslope from the prospect, other parallel fracture zones cut the limestones, and are marked by narrow, pod-like jasperoid lenses. The purpose of the workings appears to have been to explore the jasperoid gossan lenses.

District/Area Summary and Potential Conflict. Based on the preliminary scope of this study, there appears to be a low potential for conflicts between proposed alignment GV4 of the NRL and the Golden Gate Mining District based on the following:

- Distance between the small historic mining area and the proposed alternate alignment GV4 is approximately 2 to 3 miles.
- Relatively narrow and localized silver and lead mineralization (veins in fractures and replacement deposits).
- Although the mineralizing structures appear to trend toward the alternate alignment, they do not appear to extend to the alignment.
- Apparent low potential for sand and gravel and other construction materials.

7.0 CONCLUSIONS

A total of 49 areas (Plate ID Nos. 1-49) were evaluated (Table 1 and Plate 1) and classified based on results of this initial investigation with respect to whether they would likely present a low, low to medium, medium, medium to high, or high potential conflict to the NRL. The following summarizes results of this classification. Depending on the size of the area, geologic complexity, access, field observations, and other factors, several locations within an occurrence may have been evaluated. For example, the Bare Mountain Mining District included five areas that were visited, and each area was documented on a corresponding *field data* Data Sheet.

Areas Classified as Having a High Probability of Conflict. Two mineral occurrences, the Goldfield Mining District and the Clifford Mining District, were identified and classified as having a high probability for conflict with respect to the NRL. The Goldfield Mining District is traversed by two different alternative alignments. Based on results of this investigation, some of the areas traversed by the NRL alignments appear to be located on land with numerous surface and underground mine workings of unknown extent. Additional geotechnical studies to evaluate the impact of the workings would be required prior to the design and construction of the NRL through these studies. Additionally, the land/mining district is reported to contain proven ore reserves and may contain additional precious metal resources based on results of recent minerals exploration work in the area by Metallic Ventures, Inc. Private and patented land, areas of highly prospective ground, archaeologically significant features, and environmentally sensitive areas, and the presence of concerned local residents, property owners, and operators are additional factors, which contribute to this area being classified as having a high probability of conflict with NRL alignments shown on Plate 1.

Similarly, a portion of the Clifford Mining District is traversed by the NRL. Based on results of this investigation, the areas traversed may be located on land with surface and underground mine workings, which would require additional geotechnical study prior to the design and construction. In addition, the land contains possible ore reserves and precious metal resources areas of highly prospective ground, and possibly archaeologically sensitive features.

Refer to Table 1 for a more complete description of the rationale that was used to classify these two mineral occurrences as having a high probability for conflict with the NRL. A significant level of Phase 2 investigative work would be required to adequately evaluate potential conflicts associated with these two mineral occurrences.

Areas Classified as Having a Medium to High Probability of Conflict. Three mineral occurrences were classified as having a medium to high probability for conflict with the NRL: the Bare Mountain Mining District, Cuprite Mining District, and Golden Arrow Mining District. In general, these mineral occurrences were classified as having a medium to high probability of conflict because of their proximity to the NRL, previous mining history as documented in readily available literature and observed in the field, likelihood for the occurrence of mineral reserves, the apparent recent interest, or recent mineral exploration activities in some of these areas. Refer to Table 1 for a more complete description of the rationale used to classify these three mineral occurrences. A relatively significant level of Phase 2 investigative work would be required to more adequately evaluate the potential conflicts associated with these three mineral occurrences and the NRL.

Areas Classified as Having a Medium Probability of Conflict. Five mineral occurrences were classified as having a medium probability of conflict with the NRL: the Wagner Mining District, Tybo Mining District (southern portion), Reveille Valley Area, Warm Spring and Hot Well at Sarcobatus Flat, and the Caliente Area. In general, these mineral occurrences were classified as having a medium probability of conflict because of their proximity to the NRL, the moderate amount of previous mining activity, and the apparent recent interest or mineral exploration activities in some of the areas. Refer to Table 1 for a more complete description of the rationale used to classify these five mineral occurrences as having a medium probability for conflict with the NRL. Subsequent Phase 2 investigative work would be required to adequately evaluate the potential conflicts associated with these five mineral occurrences.

Areas Classified as Having a Low to Medium Probability of Conflict. Six mineral occurrences were classified as having a low to medium probability of conflict with the NRL: the Clarkdale Mining District, Bellehelen Mining District, Monitor Hills Area, Bennet Pass Area, Pozzolan Placer Area, and the Panaca Mining District. In general, these mineral occurrences were classified as having a low to medium probability of conflict because of their distance from the NRL, the apparent unfavorable geologic environment between the mineral occurrence and the alignment, or for some areas, the apparent absence of readily available historical data supporting a mineral occurrence. Refer to Table 1 for a more complete description of the rationale used to classify these five mineral occurrences as having a low to medium probability for conflict with the NRL. Subsequent Phase 2 investigative work is required to more completely evaluate the potential conflicts associated with these six mineral occurrences.

Areas Classified as Having a Low Probability of Conflict. Twenty-nine mineral occurrences were classified as having a low probability of conflict with the NRL. Approximately half of these occurrences, including the Crater Flats Area, Bullfrog Mining District, Transvaal Mining District, Oil and Gas Leases north of Beatty, Scotty's Junction Area, Stonewall Mining District, Queen City Mining District, Warm Springs Area, Reveille Mining District, Eden Mining District, Oil and Gas Leases on the west side of Garden Valley, Oil and Gas Leases – Golden Gate Range, northern portion of the Seaman Range Mining District, Comet Mining District, and the Guard Station Area (south end of Stone Cabin Valley) are recommended for subsequent Phase 2 investigative work to augment the results of this investigation. In general, these mineral occurrences were classified as having a low probability of conflict because of their distance from the NRL, the size and nature of the mineral occurrence, the apparent unfavorable geological environment between the occurrence and alignment, or for some areas, the apparent absence of readily available historical data. Refer to Table 1 for a more complete description of the rationale used for rating the potential conflicts associated with these mineral occurrences.

The remaining mineral occurrences classified as having a low probability of conflict with the NRL include the Pocopah Mining District, Thirsty Canyon-Sleeping Butte Area, Klondyke Mining District, Ellendale Mining District, Mercury Mountain Mining District, Freiberg Mining District, Quinn Canyon Mining District, Heizer Sculpture/Landform Area, Oil and Gas Leases northeast of Fox Mountain, Chief Mining District, Little Mountain Mining District, Montezuma Mining District, North and East Reveille area, and Golden Gate Mining District. In general, these mineral occurrences were classified as having a low probability of conflict because of their distance from the NRL, the apparent lack of readily available historical data regarding the areas, the size of the occurrence, the unfavorable geological environment between the occurrence and the alignment, or the non-mineral type of resource identified in some areas. Refer to Table 1 for a more complete description of the rationale that was used to classify these mineral occurrences. At this time, subsequent Phase 2 investigative work is not recommended for these specific mineral occurrences.

8.0 RECOMMENDATIONS

8.1 General

The conclusions and recommendations contained in this report, including the classification of mineral occurrences into those having the potential to create a low, medium, or high conflict with the NRL, were developed without regard to land status. Over much of the NRL, the alignment crosses lands administered by the BLM. Depending on the specific land action required of the BLM to allow construction of the NRL, the BLM may require mineral studies and reports in addition to the studies mentioned herein.

Withdrawal of lands administered by the BLM for either study or construction of the NRL may require an evaluation of the mineral potential of lands near, under, and adjacent to the proposed alignments. These studies would typically include an assessment of the potential for the withdrawn lands to contain undiscovered mineral resources and preparation of a Mineral Potential Report. The Mineral Potential Report would include an assessment of the mineral potential of all lands within the proposed withdrawal and not just those that have been rated in this report as having a medium or high potential for a conflict with the NRL. The requirements for conducting a mineral resource assessment on BLM-administered lands are contained in BLM Manual 3031 – Energy and Mineral Resource Assessment. The requirements for preparation of a Mineral Potential Report are contained in BLM Manual 3060 - Mineral Reports – Preparation and Review.

Many of the mineral occurrences listed in this report as potentially having a high or medium-high conflict with the NRL include areas where mineral rights may have been acquired by the public through the mineral leasing and mining laws in the form of mineral leases, unpatented mining claims, and patented mining claims. Where rights to the mineral resource have been acquired or claimed, different requirements will need to be met in order to withdraw or acquire lands for further study and construction of the NRL. Depending on the nature of these requirements, additional geologic studies may be required and these would be conducted during the Phase 2 investigations. The required geologic studies for all three of these situations would be similar to those described in BLM Manual 3031 – Energy and Mineral Resource Assessment, and the corresponding reports described in BLM Manual 3060 – Mineral Reports. These Manuals provide an indication of the approximate level of effort required for Phase 2 investigations.

Mineral rights that have been acquired through potential mining claims are private property. The BLM does not have jurisdiction on private land and therefore there are no BLM-required geologic studies or mineral reports on such lands. Where the NRL would cross patented mining claims, the mineral rights would need to be acquired through either lease, purchase, or other means.

Phase 2 investigations are recommended for those mineral occurrences that were classified as likely posing a high and medium–to-high potential for conflict, and four of the five mineral occurrences classified as likely posing a medium potential for conflict with the NRL. A limited Phase 2 investigation is recommended for one mineral occurrence classified as likely posing a medium potential for conflict, the mineral occurrences classified as likely posing a low to medium potential for conflict, and more than half of the occurrences classified as likely posing a low potential for conflict with the NRL. The limited Phase 2 investigation will be directed at confirming the suspected low potential conflict classification, in the case of the mineral occurrences classified as medium or low to medium; confirming that no subsequent Phase 2 investigation is required; or confirming the necessity to conduct subsequent Phase 2 investigations. At this time, based on results of this investigation, Phase 2 work is not recommended for the remaining mineral occurrences classified as likely posing a low potential for conflict with the NRL. A summary of the general scope of work to be performed for the Phase 2 investigations is provided on Table 1 and below. Descriptions of the scope of work, specific to individual mineral occurrences, will be provided in the Phase 2 work plan.

Areas Classified as Having a High Probability of Conflict. In general, the Phase 2 program for the Goldfield Mining District and the Clifford Mining District should first focus on evaluating mineral potential. A classification system of mineral resource potential and certainty of assessment should be used such as that presented in BLM Manual Section 3031, as modified in NBMG Open File Report 98-1 *Mineral and Energy Resource Assessment of the Nellis Air Force Range.* The modified classification system based on Goudarzi (1984) is more current and widely accepted by the mineral industry (Table 2).

The initial Phase 2 investigative work should be conducted in general accordance with the guidelines in BLM Manual, Section 3031 – *Energy and Mineral Resource Assessment* and applicable guidelines set forth in BLM Manual 3060- *Mineral Reports*, using the updated and modified mineral resource potential classification system as presented in Open File Report 98-1 by Tingley et al. (1998). This type of investigation generally involves defining the mineral potential, which is a prediction of the likelihood of the occurrence of these resources. The occurrence of a mineral resource does not necessarily imply that the mineral can be economically exploited or that it is likely to be developed. Mineral occurrence potential includes both exploitable and potentially exploitable occurrences. The potential for the occurrence of a mineral resource also does not imply that the quality or quantity of the resource is known.

In general, this initial portion of the Phase 2 investigation should include, but not be limited to, the following:

- Defining the objective of the mineral resource assessment.
- Reviewing and compiling additional background data and acquiring pertinent data from additional sources (e.g., aerial photographs, aeromagnetic data, etc.).
- Providing a preliminary analysis of resource complexity.
- Contacting claimants or lessees, as well as federal, state, and local agencies, for additional or more specific data.
- Conducting additional field investigations to validate existing data or address data gaps.
- Integrating the existing data with new data.
- Analyzing the integrated data so as to respond to the information needs of the decision maker.
- Estimating the mineral resources potential (Table 2) based on the preceding analysis.
- Preparing the mineral assessment report.
- Performing quality assurance/quality control (QA/QC).

In addition to the recommended Phase 2 work described above, *Mineral Reports* should be prepared in general accordance with applicable guidelines set forth in BLM Manual 3060-*Mineral Reports,* since the mining districts are partially traversed by the NRL and because of the reported presence of ore reserves. It is likely that the *Mineral Reports* will include an Economic Evaluation, Fair Market Value Determination and Mineral Appraisal Reports. A Mining Claim Validity Report may also be required. The *Economic Evaluation,* which addresses whether or not a valuable deposit has been discovered or can be inferred from existing geologic information, should include, but not be limited to, the following:

- Determining that the area contains valuable deposits through detailed review and validation of existing data.
- Investigating, reviewing, analyzing, and providing descriptions of the reserves and potential recovery methods.
- Estimating the economic viability of the resource.

- Estimating the fair market value of the resource.
- Preparing the Mineral Economic Evaluation Report.

Areas Classified as Having a Medium to High and Medium Probability of Conflict. A Phase 2 investigation is recommended for the three mineral occurrences (Bare Mountain Mining District, Cuprite Mining District, and Golden Arrow Mining District and Area), classified as likely having a medium to high potential, and four of the five mineral occurrences classified as likely having a medium potential (Wagner Mining District, southern portion of the Tybo Mining District, Reveille Valley Area, and Caliente Area), for conflicts with the NRL.

In general, the Phase 2 program should consist of conducting a mineral assessment generally consistent with the guidelines in BLM Manual Section 3031-*Energy and Mineral Resource Assessment* and applicable guidelines set forth in BLM Manual 3060-*Mineral Reports*. The assessment should include evaluating the mineral potential. A classification system of mineral potential and certainty of assessment should be used, such as that modified from BLM Manual Section 3031-*Energy and Mineral Resource Assessment*, and others, as presented in NBMG Open File Report 98-1 *Mineral and Energy Resource Assessment of the Nellis Air Force Range,* (Tingley et al., 1998). The modified classification system based on Goudarzi (1984) is more current and is widely accepted by the mineral industry (Table 2). The scope of work to be conducted should include, but not be limited to, the following:

- Defining the objective of the mineral resource assessment.
- Reviewing and compiling additional background data and acquiring pertinent data from additional sources (e.g., aerial photographs, aeromagnetic data, etc.).
- Providing a preliminary analysis of resource complexity.
- Contacting claimants or lessees, as well as federal, state, and local agencies, for additional or more specific data.
- Conducting additional field investigations to validate existing data or address data gaps.
- Integrating the existing data with new data.
- Analyzing the integrated data so as to respond to the information needs of the decision maker.
- Estimating the mineral resources potential based on the preceding analysis.
- Preparing the mineral assessment report.
- Performing QA/QC.

Results of the mineral assessment may result in some of the occurrences requiring that *Mineral Reports* be prepared in general compliance with guidelines set forth in applicable portions of BLM Manual Section 3060-*Minerals Reports.*

Areas Classified as Having a Medium, Low–to-Medium and Low Probability of Conflict. A limited Phase 2 investigation is recommended for one of the five mineral occurrences (Warm Spring and Hot Well at Sarcobatus Flat) classified as having a medium potential, and the four mineral occurrences (Clarkdale Mining District, Monitor Hills Area, Pozollon Placer Area, and Panaca Mining District) classified as having a low to medium potential for conflicts with the NRL. A limited Phase 2 investigation is also recommended for approximately half of the mineral occurrences classified as likely posing a low potential for conflict with the NRL (Table 1). For these mineral occurrences, subsequent Phase 2 investigative work will likely be limited and specific in scope and directed at obtaining additional data to further assess potential conflicts with the NRL. These Phase 2 investigations should include, but not be limited to, the following:

- Obtaining and compiling additional background data.
- Conducting additional personal interviews focusing on filling in data gaps and data validation.
- Conducting additional field investigations, such as location verification and reconnaissance of areas between the site of interest and the NRL, as necessary.
- Integrating this subsequent data with the results of this Phase 1 investigation.
- In the case of the mineral occurrences classified as low, confirm the suspected low potential conflict classification (no subsequent Phase 2 investigation required) **or**,
- In the case of the mineral occurrences classified as medium or low to medium, confirm that no subsequent Phase 2 investigation is required, **or**
- Conduct an *Energy and Mineral Resource Assessment* in general accordance with the guidelines in BLM Manual, Section 3031 and applicable guidelines set forth in BLM Manual 3060-*Mineral Reports*, using the updated and modified mineral resource potential classification system and certainty of assessment as presented in Open File Report OF-98-1 *Mineral and Energy Resource Assessment of the Nellis Air Force Range* (Tingley et al., 1998), for those areas in which additional Phase 2 work is required.

Based on information obtained from this investigation, Phase 2 investigations are not recommended for the remaining mineral occurrences classified as likely posing a low potential for conflict with the NRL.

The proposed Phase 2 investigations presented herein specifically do not include conducting subsurface exploration such as drilling or trenching. These types of invasive actions may be recommended, if deemed necessary, for inclusion into subsequent, more focused investigative phases of the NRL.

A summary of suggested recommendations for each of the mineral occurrences evaluated is provided as Table 1 of this report. Recommendations, including a work plan, schedule, and budget, to assess the mineral potential for each identified area of conflict within and along the NRL, to the level necessary to support the land withdrawal or land acquisition process, will be provided in a Phase 2 work plan, under separate cover.

8.2 Development of a Phase 2 Work Plan

The scope of work for this Phase 1 investigation included identifying mineral occurrences along the NRL and evaluating each occurrence for its potential to pose a conflict. The Phase 2 program will focus on evaluating the mineral potential along the NRL and satisfying regulatory requirements in support of the land withdrawal and acquisition process. A classification system of mineral potential and certainty of assessment that is widely accepted by the mineral industry would be used, such as that presented in BLM Manual Section 3031 and applicable guidelines set forth in BLM Manual 3060, or as modified from Gourdazi (1984), in NBMG Open File Report 98-1 (Table 2). The potential for mineral resources is a prediction of the likelihood of the occurrence of these resources. The occurrence of a mineral resource does not necessarily imply that the mineral can be economically exploited or that it is likely to be developed; mineral potential includes both exploitable and potentially exploitable occurrences. The potential for the occurrence of a mineral resource also does not imply that the quality or quantity of the resource is known.

A Phase 2 investigation will be recommended for mineral and energy occurrences classified as likely posing a high, and medium-to-high potential for conflict and for about two-thirds of the occurrences classified as likely posing a medium conflict with the NRL. The investigative work should generally follow those procedures, to the extent that they are applicable, as indicated in the BLM Manual, Section 3031 – *Energy and Mineral Resource Assessment* and BLM Manual 3060-*Mineral Reports*. It is likely that the recommended Phase 2 work will include, but not be limited to, the following:

1. Defining the objective of the mineral resource assessment.

2. Reviewing and compiling additional background data and acquiring pertinent data from additional sources including, but not limited to, aerial photographs, aeromagnetic data, and geochemical data.

3. Providing a preliminary analysis of resource complexity.

4. Contacting claimants or lessees, as well as federal, state, and local agencies, for additional or more specific data.

5. Conducting additional field investigations to validate, to the extent possible, existing data or address data gaps.

6. Integrating the existing data with new data.

7. Analyzing the integrated data so as to respond to the information needs of the decision maker.

8. Estimating the mineral resources potential based on the preceding analysis.

9. Preparing the mineral and energy resource assessment report.

10. Performing QA/QC.

Based on results of this limited investigation, a more comprehensive Phase 2 investigative program will be recommend for two areas, the Goldfield Mining District and the Clifford Mining District. Because mineral reserves have been identified within these two mining districts, both of which are partially traversed by the NRL, Mineral Reports, in general compliance with applicable guidelines set forth in BLM Manual Section 3060, are recommended in addition to conducting the *Energy and Mineral Resource Assessment* study. It is likely that the *Mineral Reports* will actually consist of several reports, including an Economic Evaluation Report, Fair Market Value Determination and probably a separately prepared Mineral Appraisal Report. A Mining Claim Validity Report may also be required. The Economic Evaluation should verify that a valuable deposit has been discovered, or can be inferred from existing geologic information, and may include the following:

1. Determining that the area contains valuable deposits through detailed review and validation of existing data.

2. Providing descriptions of the reserves and potential recovery methods.

3. Estimating the economic viability of the resource.

4. Estimating the fair market value of the resource.

5. Preparing the various Mineral Reports in general accordance with applicable section of BLM Manual 3060.

The remaining approximately one-third of the mineral ccurrences classified as likely posing a medium potential for conflict, the occurrences/areas classified as likely posing a low to medium potential for conflict, and approximately half of the areas classified as likely posing a low potential for conflict will be recommended for limited Phase 2 investigations. For these sites, subsequent Phase 2 investigative work will generally be limited in scope and include, but not be limited to, the following:

1. Obtaining and compiling additional background data.

2. Conducting additional personal interviews focused on filling in data gaps.

3. Conducting additional field investigations such as location verification and reconnaissance of areas between the site of interest and the NRL, as necessary.

4. Integrating this subsequent data with the results of this Phase 1 investigation.

5. In the case of the mineral occurrences classified as low, confirming the suspected low potential conflict classification (no subsequent Phase 2 investigation required) **or**, in the case of the mineral occurrences classified as medium or low to medium, confirm no subsequent Phase 2 investigation is required, **or**

6. Conducting an *Energy and Mineral Resource Assessment* in general accordance with the guidelines in BLM Manual, Section 3031, and applicable guidelines set forth in BLM Manual 3060-*Mineral Reports*, using the updated and modified mineral resource potential classification system and certainty of assessment as presented in Open File Report *OF-98-1 Mineral and Energy Resource Assessment of the Nellis Air Force Range* (Tingley et al., 1998) for those areas in which additional Phase 2 work is recommended.

Other mineral occurrences classified as likely posing a low potential for conflict with the NRL were identified as not requiring a subsequent Phase 2 investigation at this time (Table 1).

We did not anticipate that the proposed Phase 2 investigations would include conducting drilling or trenching. These types of investigational procedures, if deemed necessary, should be recommended for inclusion into subsequent investigative phases of the NRL.

9.0 LIMITATIONS

This study is limited to the accuracy of the background data or sources used including publications, interviews, and internet data. A significant portion of the published data for mineral occurrences used in the preparation of this report may be outdated, and discrepancies in the published data and databases, particularly regarding mine locations and history, commonly occurs. Information regarding recent or ongoing minerals exploration activities obtained from the internet was not verified as part of this preliminary limited investigation. We do not guarantee or warrant that all mineral occurrences near to, adjacent to, or traversed by the NRL were identified as part of this preliminary limited investigation. Additional mineral occurrences may be reported or discovered between the time of submission of this report and the construction of the NRL. This is because mineral exploration activity is ongoing, or previously publicly unavailable data may be published or otherwise made available.

Information regarding mineral occurrences obtained from personal interviews was not verified by us as part of this preliminary initial investigation. Such information may be based on events occurring months or years ago, may have been passed on to interviewees from other sources, or may not be an accurate present memory of the information or events.

The *district summary, field data*, and *interview* Data Sheets were prepared by the investigators to provide information for this preliminary limited investigation (Appendix). The information included on these sheets frequently represents the initial observation, interpretation, recommendation, or opinion of the investigator performing the fieldwork. As this limited investigation progressed, some of this information may have changed or become outdated as a result of obtaining additional information during the course of this study. Therefore, these sheets are to be considered preliminary and the information contained in them may have been or may be superseded by new information as it became or becomes available. Furthermore, the information collected by the investigators and provided on the data sheets in the Appendix was not independently checked or verified for accuracy, and different investigators observing the same area may make additional or different observations, have different opinions about the significance of site features, reach different conclusions, and make different recommendations.

An evaluation of geologic hazards, geotechnical issues for design, environmental concerns or hazards, and issues regarding groundwater or surface water quality or resources was not included in this preliminary limited investigation. Geologic, geotechnical, hydrogeologic, and environmental issues including, but not limited to, evaluating the extent, nature, and location of surficial and underground workings, characterization of existing mine waste, and water resources distribution and availability, should be addressed as part of ongoing and future geotechnical, environmental, and water resources studies for the NRL. Information with regard to the specific location and extent of surficial and underground mine workings contained in this report is for the purpose of estimating the extent of past mineral exploration and development in a mining district. This information should not be used for engineering or design studies, and additional studies may be required to evaluate the extent of old mine workings and associated environmental issues.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. BSC should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this report.

No warranty, express or implied, is made regarding the conclusions, recommendations, and opinions presented in this report. Our summary of findings, conclusions, and recommendations are based solely on the review and compilation of readily available background information obtained from published documents, databases, and the internet; information obtained from personal interviews; field observations associated with the field reconnaissance; and the professional opinions of the investigators. It should be understood that the conditions of the NRL area could change with time as a result of normal processes or the activities of man. The findings of this report may, therefore, be invalid over time, in part or in whole, by changes over which authors of this report have no control.

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TABLE 1
SUMMARY OF MINERAL OCCURRENCES, CONFLICT PROBABILITY, AND PHASE 2 RECOMMENDATIONS

Occurrence						Conflict		
Area / Mining District	County	Plate ID No.	Data Sheet No.	Information Source	Location / Distance from NRL	Probability	Rationale	Phase 2 Recommendation
Pocopah Mining District (40 Mile Canyon, Quartz Mountain, Calico Hills)	Nye	1	M1-1-DS M1-1-I	- Mining district area outline shown on Plate is from NBMG Report 47 - Previous knowledge of the area - Various NBMG and other publications - Interview	As indicated in NBMG Report 47, the western boundary of the district is approximately 2 1/4 miles east of the easternmost NRL alternative alignment within the Nevada Test Site (NTS). The relatively minor amount of historic mining activity has occurred approx. 5 to 6 miles northeast of the NRL.	Low	There appears to be a low potential for conflict between the NRL and the Pocopah Mining District based on the following: ▸ The Pocopah Mining District lies entirely within the NTS. Distance between the rail corridor and known historically mined areas of the district. The western boundary of the district is approximately 2 to 3 miles east of the eastern-most NRL. ▸ Small, narrow, localized areas (radial fracturing) of possible copper, gold, silver, and magnesite mineralization. ▸ Apparent trends of structures controlling mineralization and favorable rock types do not appear to trend toward the NRL. Nevada Bureau of Mines and Geology Open File Report 84-2, A Mineral Inventory of the Nevada Test Site, and Portions of Nellis Bombing and Gunnery Range Southern Nye County, Nevada, (Quade, Tingley and others, 1984) reported that surface examinations and sample assays of prospects in the central and southeastern parts of the district revealed no anomalous mineralization.	None at this time.
Crater Flats (Red Cone and Black Cone)	Nye	2	M1-1-FD1 (Red Cone & Black Cone) M1-1-FD2 (Steve's Pass to Crater Flat at Little Cones) M1-2-I	- Area observed during field reconnaissance - Previous knowledge of the areas	Crater Flats area including Steve's Pass is 2 to 7 miles southwest of the NRL. Actively quarried volcanic cone observed from U.S. Highway 95 is approx. 12 miles south of the NRL.	Low	There appears to be a low potential for conflict between the NRL and the Crater Flat area based on the following: ▸ Large distance between known industrial (cinder) occurrences and the NRL.	Conduct a limited Phase 2 investigation.
Bare Mountain (Fluorine) Mining District and BW3	Nye	3	M1-3-DS M1-3-I (Sterling Metals Corp) M1-3-FD1 (Steves Pass Area) M1-3-FD2 (North of Bare Mt Mining District to the Silicon Mine, incl. Thompson Mine) M1-3-FD3 (Vidano Mine) M1-3-FD4 (Daisy Mine) M1-3-FD5 (Shorter White Mine)	- Mining district area outline shown on Plate is from NBMG Report 47 - Previous knowledge of the mining district - Various NBMG publications and other sources - Interview - The Nevada Mineral Industry - Minerals Exploration Co website	As indicated in NBMG Report 47, the northeastern portion of this mining district is traversed by the NRL. The south-westernmost NRL alignments BW1 and BW3 traverses the north-eastern portion of the Bare Mountain Mining District. The vast majority of historic mining activity has occurred more than 2 miles south of these NRL alignments. Portions of the north-easternmost alignment, BW2, traverses the north-easternmost area of the mining district.	Medium to High	There appears to be a medium to high potential for conflicts between the NRL and the Bare Mountain Mining District based on the following: ▸ The NRL traverses a known, recently active silica quarry (notice of intent). ▸ Silica and clay are present and gold and silver mineralization is close to the NRL. ▸ Recent gold mining by Glamis Gold Ltd. at the Daisy Mine is located within the Bare Mountain Mining District, and approximately 4 to 5 miles from the NRL. ▸ Recent (2003) exploration and gold mining at the Sterling Property (Sterling Mine) by Imperial Metals Corp. located about 4 to 5 miles west of the NRL. ▸ Reportedly active decorative rock operations in upper Beatty Wash, approximately 2 miles northwest of the Daisy Mine leach pad. The Beatty area, close to and east of U.S. Highway 95, reportedly contains various indus-trial mineral deposits including clay, fluorspar, building stone, pumice, pumicite or cinder, silica, and zeolite, as indicated in NBMG Map 142.	Conduct a Phase 2 investigation generally consistent with BLM Manual Section 3031-Energy and Mineral Resource Assessment and applicable guidelines set forth in BLM Manual 3060-Mineral Reports. Classify the mineral potential and certainty of assessment as modified and presented in NBMG Open File Report 98-1 Mineral and Energy Resource Assessment of the Nellis Air Force Range.

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Bullfrog (Rhyolite) Mining District	Nye	4	M1-4-DS M1-4-I M1-4-FD1 (Oasis Mt) M1-4-FD2 (North of the Pioneer Mine) M1-4-FD3 (Silica Quarry (David Spicer Property?)) M1-4-FD4 (Pioneer Mine)	- Mining district location and outline shown on Plate is from NBMG Report 47. - Previous knowledge and field work in the mining district.BLM (Tonopah) personnel. - Various NBMG publications and other sources - Interview	As indicated in NBMG Report 47, the northeastern portion of this mining district is located approximately 1 mile west of the NRL. The vast majority of the mine workings are located approximately 5 miles southwest from the NRL.	Low	There appears to be a low potential for conflicts between the NRL and the Bullfrog Mining District based on the following: ▸ Distance between the NRL and historically mined areas of the district. ▸ Generally small, narrow, localized areas (fissures and veins) of gold, silver, and lesser copper mineralization. ▸ Strength of structures controlling mineralization appears to decrease towards the NRL. Silica resources associated with the recently operated David Spicer silica mine. ▸ Possible clay resources. Geothermal resources currently being utilized at Bailey's Hot Spring spa, just north of Beatty (direct use of geothermal resource).	Conduct a limited Phase 2 investigation.
Transvaal (Nyopolis) Mining District	Nye	5	M1-5-DS M1-5-FD1 (Spicer's Decora-tive Stone Quarry)	- Mining district location and outline shown on Plate is from NBMG Report 47. - Previous knowledge - Industrial Mineral Deposits in Nevada Map 142 - Various NBMG publications	Situated primarily within and adjacent to the southwest boundary of the NTTS, north of Beatty Wash. As indicated in NBMG Report 47, the southwestern portion of the mining district is less than one mile from the eastern NRL alignment. The majority of the Transvaal Mining District (precious metal occurrences) are located within the NTTS. The decorative rock quarry is located approximately 1/2 mile southwest of the NTTS boundary and approximately 1.5 miles northeast of the NRL.	Low	There appears to be a low potential for conflicts between the NRL and the Transvaal Mining District based on the following: ▸ Majority of the Transvaal Mining District lies within the NTTR. ▸ Small, narrow, localized areas of gold and copper mineralization. ▸ Apparent absence of reported production and no evidence of ore mineralization on the dumps of or within the shallow working of the district (Tingley and others, 1998). ▸ Decorative rock resources based on the presence of the apparently intermittently operating David Spicer quarry. Open File Report 98-1, Mineral and Energy Resource Assessment of the Nellis Air Force Range, (Tingley and others, 1998) reported a moderate potential, certainty level C for hot-springs-type mercury deposits for areas only within the NTTR, and a low potential, certainty level B, for shallow high-grade and bulk-mineable, epithermal precious-metal deposits.	Conduct a limited Phase 2 investigation.
Thirsty Canyon / Sleeping Butte Area and OV3	Nye	6	M1-6-DS M1-6-FD1 (Spicer's Decorative Rock) M1-6-FD2 (OV3) M1-6-FD3 (OV3)	- Area identified in NBMG Open-File Report 98-1 - BLM (Tonopah) personnel - Various NBMG publications	Situated within and adjacent to the southwest boundary of the NTTS. The decorative rock quarry is located approximately 2 miles northeast from the NRL. The Thirsty Canyon-Sleeping Butte area is traversed by the OV3 segment of the proposed NRL	Low	There appears to be a low potential for conflicts between the NRL and the Thirsty Canyon-Sleeping Butte Area based on the following: ▸ Majority of the Thirsty Canyon-Sleeping Butte Area lies within the NTTR. ▸ Distance between known mineral resources and the NRL.(westernmost alignment). ▸ The OV3 proposed alternate alignment traverses a portion of the mining claims and oil and gas leases (Plate ID No. 7). ▸ Approximately 10 years ago, the boundary of the in this area was reportedly resurveyed and was discovered to include the decorative stone quarry in Thirsty Canyon, therefore the mining claims for the quarry were withdrawn. Open File Report 98-1, Mineral and Energy Resource Assessment of the Nellis Air Force Range (Tingley and others, 1998), reported a low potential, certainty level B for epithermal precious-metals deposits in the area.	None at this time.

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Oil and Gas Leases North of Beatty and OV3	Nye	7	M1-6a-I (Oil and Gas Leases interview)	- BLM LR2000 database	The NRL traverses some of the oil and gas leases. There are 14 sections of oil and gas leases located approximately 12 to 15 miles north of Beatty. The NRL traverses the southwest portion of the oil and gas lease block. A portion of the oil and gas leases are traversed by the OV3 segment of the proposed NRL	Low	There appears to be a low potential for conflicts between the NRL and the oil and gas leases north of Beatty based on the following: ▸ Apparent absence of exploration activity associated with these leases, which reportedly have been "active" since the 1970s. ▸ The OV3 proposed alternate alignment traverses a portion of the oil and gas leases.	Conduct a limited Phase 2 investigation.
Warm Spring and Hot Well at Sarcobatus Flat between Plate ID No. 7 and No. 9	Nye	8	M1-6b-DS (warm spring and hot well)	- Nevada Geothermal Resources Map 141	One hot well located approximately 0.25 mile northeast of the NRL. One warm spring located approximately 0.5 mile northeast of the NRL.	Medium	There appears to be a moderate potential for conflicts between the NRL and the geothermal occurrences in this area based on the following: ▸ Apparent proximity of the NRL to the identified geothermal occurrences in the area (at the map scale used for this investigation, both occurrences plot at or within about 1/8 mile of the NRL).	Conduct a limited Phase 2 investigation.
Clarkdale (Tolicha, Yellowgold) Mining District	Nye	9	M1-7-DS M1-7-FD1 (gravel operation, Tolicha Wash)	- Mining district location and outline shown on Plate is from NBMG Report 47 - District identified in NBMG Open-File Report 98-1 - Previous knowledge of the mining district - Various NBMG publications	As indicated in NBMG Report 47, the southwestern portion of this mining district is located approximately 1/4 to 1/2 mile east of the easternmost NRL alignment. Approximately 2/3 of the Clarkdale Mining District is within the NTTS and the majority of the precious metal occurrences are located within the NTTS. The Tolicha Mining District is located entirely within the NTTS. Gravel operation in Tolicha Wash is located within the NRL alignment.	Low to Medium	There appears to be a low to medium potential for conflicts between the NRL and the Clarkdale/Tolicha Mining District based on the following: ▸ Approximately 2/3s of the Clarkdale Mining District and the entire Tolicha Mining District is within the NTTR. ▸ Distance between the NRL and known historically mined areas of the district. ▸ Generally discontinuous, relatively narrow, brecciated shear zones containing some gold and silver mineralization. ▸ Presence of a relatively large gravel pit actively mined, located within or close to the NRL (similar gravel pits continue northward to the southern extent of the Cuprite Mining District). Open File Report 98-1, Mineral and Energy Resource Assessment of the Nellis Air Force Range (Tingley and others, 1998) reported a high potential, certainty level C, for small-tonnage, bonanza-vein, gold-silver deposits for areas within the NTTR, and a moderate potential, certainty level B, for bulk-mineable gold-silver deposits in altered favorable lithologic units (medium).	Conduct a limited Phase 2 investigation.
Scotty's Junction Area	Nye	10	M1-8-DS M1-8-FD1 (Gravel operations trending parallel to US-95)	- Area identified in NBMG Open-File Report 98-1 - Field observations	This area includes about 2 square miles in the eastern escarpment of Pahute Mesa, along the east edge of Sarcobatus Flat and scattered outcrops of hydrothermally altered rocks exposed about 3.5 miles east of Scotty Junction.Scotty's Junction Area is within the NTTS, approximately 2 miles east of the NRL.	Low	There appears to be a low to medium potential for conflicts between the NRL and the Scotty's Junction Area based on the following: ▸ Scotty's Junction area lies both within the NTTR (Tingley and others, 1998) and outside the NTTR in areas of private property (farming, ranching, water wells). ▸ No known ore grade mineralization, only hydrothermal alteration and calcite veins reportedly containing anomalous concentrations of gallium, mercury, molybdenum, antimony, and tungsten. ▸ Presence of possible sand and gravel occurrences/resources and water wells. Open File Report 98-1, Mineral and Energy Resource Assessment of the Nellis Air Force Range (Tingley and others, 1998) reported a low potential, certainty level B, for bulk-mineable gold-silver deposits in altered favorable lithologic units within the NTTR. These favorable units and/or zones of alteration do not appear to extend into the NRL.	Conduct a limited Phase 2 investigation.

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Wagner Mining District and BC2	Nye	11	M1-9-DS M1-9-FD1 (Wagner Mining District)	- Mining district location and outline shown on Plate is from NBMG Report 47 - District identified in NBMG Open-File Report 98-1 - Various NBMG publications	As indicated in NBMG Report 47, the easternmost portion of this relatively small mining district is located approximately 1/4 mile east of the NRL. The majority of the historic mining activity and the area visited during the field reconnaissance are located approximately 1 mile east of the NRL. The easternmost proposed alternate alignment, BC2, located just west of the NTTR, is approximately 1 to 2 miles east of the easternmost boundary of the Wagner Mining District.	Medium	There appears to be a medium potential for conflicts between the NRL and the Wagner Mining District based on the following: ▸ Relatively recent exploration efforts (drilling and trenching) in the area by several exploration companies, including Gulf Resources/BHP. ▸ Close to the NRL. Open File Report 98-1, Mineral and Energy Resource Assessment of the Nellis Air Force Range (Tingley and others, 1998) reported a high mineral resource potential, certainty level C, for the occurrence of a limited tonnage of mixed oxide and sulfide copper ore and moderate resource potential, certainty level B for the occurrence of a buried porphyry copper deposit. Low mineral resource potential, certainty level C, is assigned to that portion of the NTTR adjoining the Wagner District.	Conduct a Phase 2 investigation consistent with BLM Manual Section 3031-Energy and Mineral Resource Assessment and applicable guidelines set forth in BLM Manual 3060-Mineral Reports. Classify the mineral potential and certainty of assessment as modified and presented in NBMG Open File Report 98-1 Mineral and Energy Resource Assessment of the Nellis Air Force Range.
Stonewall Mining District	Nye	12	M2-1-DS M2-1-FD1 (Stonewall Mine and area, east of the NRL)	- Mining district location and outline shown on Plate is from NBMG Report 47 - District identified in NBMG Open-File Report 98-1 - BLM (Tonopah) personnel - Various NBMG publications	As indicated in NBMG Report 47, the westernmost portion of this mining district is traversed by the NRL. The majority of the historic mine workings are located approximately 3 miles east of the NRL. The field reconnaissance included the area approximately 1/4 to 3 miles east of the NRL.	Low	There appears to be a low potential for conflicts between the NRL and the Stonewall Mining District based on the following: ▸ Distance between the NRL and the currently identified areas of mineralization. ▸ Bonanza-type vein deposits containing gold and silver mineralization in quartz is prominent at the historically mined areas and continuing easterly, away from the NRL. ▸ Structures controlling gold and silver mineralization appear to weaken westerly, in the direction of the NRL based on field reconnaissance. ▸ Relatively recent mineral exploration activity by Seabridge Gold Inc. in the area. Open File Report 98-1, Mineral and Energy Resource Assessment of the Nellis Air Force Range (Tingley and others, 1998) reported a high potential, certainty level C, for small-tonnage, bonanza-vein, epithermal gold-silver deposits, at depth, for areas adjacent to the NTTR, and a moderate potential, certainty level B, for stockwork-disseminated, gold-silver deposits, at depth near the vein system.	Conduct a limited Phase 2 investigation.
Cuprite Mining District	Nye	13	M2-2-DS M2-2-I M2-2-FD1 (Cuprite MD, east of US Hwy 95) M2-2-FD2 (lime-stone quarry) M2-2-FD3 Cuprite MD, west of US Hwy 95) M2-2-FD4 (Cu-prite MD, east of US Hwy 95)	- Mining district location and outline shown on Plate is from NBMG Report 47 - District identified in NBMG Open File Report 98-1 - BLM (Tonopah) personnel - Various NBMG publications	As indicated in NBMG Report 47, the easternportion of this mining district lies approximately 1/4 mile west of the NRL. Located approximately 1/4 mile west of the Stonewall Mining District. The areas visited are approximately 0 to 0.5 miles east and 1 to 3 miles west of the NRL.	Medium to High	There is a medium to high potential for conflicts between the NRL and the Cuprite Mining District based on the following: ▸ The NRL is close to historically mined and recently identified areas of mineralization in the district. ▸ Structures and/or favorable rock types controlling mineralization in the area of the historic mine workings appear to continue into the general area of the NRL. ▸ Relatively recent production of silica from a quarry located approximately 1/10 mile west of the NRL. ▸ Presence of a relatively large geothermal system and evidence of previous geothermal exploration efforts. ▸ Evidence of recent exploration activity, as evidenced by mining claims and drilling. ▸ Copper, silver, gold, sulfur, clay, silica, and geothermal resources have been identified in the area close to the NRL.	Conduct a Phase 2 investigation generally consistent with BLM Manual Section 3031-Energy and Mineral Resource Assessment and applicable guidelines set forth in BLM Manual 3060-Mineral Reports. Classify the mineral potential and certainty of assessment as modified and presented in NBMG Open File Report 98-1 Mineral and Energy Resource Assessment of the Nellis Air Force Range.

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Goldfield Mining District (including Goldfield Main, McMahon Ridge, and Gemfield) and GF4	Nye	14	M2-3-DS M2-3-I1 M2-3-I2 M2-3-I3 M2-3-I4 M2-3-I5 M2-3-I6 M2-3-FD1 (Goldfield Main) M2-3-FD2 (Goldfield Main, Diamondfield/McMahon Ridge east to Black Butte, Sandstorm) M2-3-FD3 (Old rail grade intersects proposed alignment GF4, approximately 5 miles SE of Goldfield) M2-3-FD4 (approx. 1 mile east of Meda Pass, and 3 miles SE of Goldfield) M2-3-FD5 (saddle between Myers and Mira Mountain, and approx. 1 miles SE of Goldfield)	- Mining district location and outline shown on Plate is from NBMG Report 47 - District identified in NBMG Open File Report 98-1 - Previous knowledge and field work in the mining district - Various NBMG publications and interviews - The Nevada Mineral Industry minerals exploration company website	As indicated in NBMG Report 47, the three NRL alignments traverse portions of this large mining district, particularly the westernmost alignment. A portion of the mining district straddles U.S. Highway 95. However, the majority of the district occurs east of the highway.	High	There appears to be a high potential for conflicts between the NRLand the Goldfield Mining District based on the following: ▸ The three NRL alignments, including the two previous Caliente Rail Corridor alignments GF1 and GF5 and the most recently proposed alternate easternmost alignment, GF4, traverse portions of the Goldfield Mining District. ▸ Proposed alignment, GF4, may possibly interfere with the commercial/recreational gemstone fee collecting area in the Gemfield area as discussed in the Montezuma Mining District. ▸ Identified gold and silver resources and the potential for porphyry copper mineralization in the district. ▸ Favorable geologic environment for the occurrence of buried gold, silver, and copper ore deposits, large-scale gold and silver deposits and potential porphyry copper plays. ▸ Structures and/or favorable rock types controlling mineralization are traversed by and/or are close to the NRL. ▸ Inferred and indicated ore reserves are traversed by and/or close to the NRL. ▸ Significant and successful on-going exploration programs have been and continue to be conducted by MVGI. ▸ Land status issues associated with patented and unpatented mining claims. The Goldfield Project area reportedly consists of 385 patented and 849 unpatented claims covering more than 20,600 acres in Esmeralda and Nye Counties. ▸ Environmental issues associated with past ore processing. ▸ Geotechnical issues associated with extensive underground mine workings. ▸ Geotechnical issues (rockfall, landslide, etc.) along the foot of Malpais Mesa, relatively close to proposed alternate alignment GF4. ▸ Potential cultural and archeological issues associated with historic mining structures, sites, etc. The NRL alignments traverse various historical structures and previous mining activities associated with the town of Goldfield. Proposed alternate alignment GF4 traverses historic structures at the western portion of of the town of Goldfield, including a public cemetery. Open File Report 98-1, Mineral and Energy Resource Assessment of the Nellis Air Force Range (Tingley and others, 1998) reported a high potential, certainty level C, for epithermal gold mineralization, for areas within the NTTR, and a moderate potential, certainty level B, for bulk-mineable precious-metal deposits, in areas adjacent to and west of the NTTR. Tingley also stated that mineralization at Quartz Mountain (within both the Goldfield Mining District and the NTTR) is almost certainly part of the mineral deposition of the main Goldfield District.	Conduct a Phase 2 investigation generally consistent with BLM Manual Section 3031-Energy and Mineral Resource Assessment and applicable guidelines set forth in BLM Manual 3060-Mineral Reports. Classify the mineral potential and certainty of assessment as modified and presented in NBMG Open File Report 98-1 Mineral and Energy Resource Assessment of the Nellis Air Force Range. Prepare Mineral Reports (e.g., economic evaluation, appraisal, etc.) in general compliance with applicable guidelines set forth in BLM Manual Section 3060- Mineral Reports because a portion of the mining district is traversed by the NRL and the reported presence of ore reserves.

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Klondyke Mining District	Nye	15	M2-4-DS M2-4-FD1 (Klondyke Mining District workings/area)	- Mining district location and outline shown on Plate is from NBMG Report 47 - Previous knowledge of the mining district - Various NBMG publications	As indicated in NBMG Report 47, the eastern portion of this mining district lies approximately 2 miles west of the NRL. The majority of the historic mining activity is an area located approximately 3 miles west of the NRL.	Low	There appears to be a low potential for conflicts between the NRL and the Klondyke Mining District based on the following: ▸ Distance between the NRL and historically mined areas of the district. ▸ Apparent low recorded production of the district. ▸ Relatively small, narrow, localized areas of silver, gold, copper, and lead mineralization. ▸ Trends of structures controlling mineralization and favorable rock types appearing not to trend towards the NRL. Relatively recent mining claim staking (Mineral Exploration and Development Company) observed in the area.	None at this time.
Monitor Hills Area	Nye	16	M2-5-DS M2-5-FD1 (decorative stone quarry)	- BLM (Tonopah) personnel - Local residents in the Goldfield area - The Nevada Minerals Industry	The southern portion of the Monitor Hills area is approximately 4 miles north of the NRL. The decorative stone quarry is located approximately 12 miles north of the NRL.	Low to Medium	There appears to be a low to medium potential for conflicts between the NRL and the Monitor Hills Area based on the following: ▸ Previous reported mineral exploration and recent and on-going exploration programs by Golconda Resources, Ltd. have defined potential silver and gold resources in the southern Monitor Hills and the Monitor Flat area, in close proximity (2 to 4 miles) to the NRL. ▸ A decorative stone quarry is 8 to 10 miles away from the NRL. Apparent absence of this area being defined as a mining district.	Conduct a limited Phase 2 investigation.
Ellendale Mining District	Nye	17	M2-6-DS M2-6-FD1 (Jumbo Mine Area)	- Mining district location and outline shown on Plate is from NBMG Report 47 - Various NBMG publicationsThe Nevada Minerals Industry	As indicated in NBMG Report 47, the district lies mainly in the small portion of the Monitor Range lying south of Hwy 6. The southern portion of the Ellendale Mining district is approximately 4 miles north of the NRL. The areas visited (closest to the alignment-Jumbo Mine Area) lies approximately 4 to 5 miles northwest of the NRL.	Low	There appears to be a low potential for conflicts between the NRL and the Ellendale Mining District based on the following: ▸ Distance between the NRL and historically mined and currently identified areas of mineralization in the district. Apparently, relatively small, narrow, localized vein deposits with zones of high-grade gold and silver mineralization as well as localized replacement deposits (Jumbo barite mine) and areas of base metal mineralization.	None at this time.
Golden Arrow Mining District including Silverbow MD	Nye	18	M2-7-I M2-7-DS1 (Arrowhead MD) M2-7-FD1 M2-7-FD2 M2-7-DS2 (Silverbow MD)	- Mining District area as shown in NBMG Report 47 - Industry professionals - BLM (Tonopah) personnel - Various NBMG publications - The Nevada Minerals Industry	As indicated in NBMG Report 47, the northwest portion of the Golden Arrow Mining District lies approximately 1 mile southeast of the NRL. The areas visited are the historic mine workings approximately 3 to 4 miles southeast of the NRL.	Medium to High	There appears to be a medium-high potential for conflicts between the NRL and the Golden Arrow Mining District based on the following: ▸ Mining district is relative close to the NRL. ▸ Distance between the NRL and areas of recent exploration and identified ore reserves currently is not known. ▸ The NRL appears to overlap some of the mining claims in the area. ▸ Structures controlling mineralization and favorable rock types appear to trend toward the NRL. The area has been the site of numerous mineral exploration programs that reportedly have led to the estimation of an approximately 300,000- to 350,000- ounce gold resource.	Conduct a Phase 2 investigation generally consistent with BLM Manual Section 3031-Energy and Mineral Resource Assessment and applicable guidelines set forth in BLM Manual 3060-Mineral Reports. Classify the mineral potential and certainty of assessment as modified and presented in NBMG Open File Report 98-1 Mineral and Energy Resource Assessment of the Nellis Air Force Range.

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Guard Station, south end of Stone Cabin Valley	Nye	19	M2-8-FD1 (at the NAFR boundary) M2-8-I1	- Field observations during reconnaissance - Interview at guard station	The areas visited lies approximately 6 miles southeast of the NRL.	Low	There appears to be a low to medium potential for conflicts between the NRL and the Guard Station Area based on the following: ▸ The NRL traverses portions of the area. ▸ Recent mining claims have been staked within and adjacent to the NRL. ▸ No obvious mineral and/or energy occurrences in this area.	Conduct a limited Phase 2 investigation.
Bellehelen Mining District	Nye	20	M3-1-DS M3-1-I M3-1-FD1 (middle of MD) M3-1-FD2 (range front area)	- Mining district location and outline shown on Plate is from NBMG Report 47 - Various NBMG publications	As indicated in NBMG Report 47, the Bellehelen Mining District is located approximately 3 to 4 miles southeast of the NRL. The areas visited lie approximately 4 to 5 miles (center of the mining district) from the NRL.	Low to Medium	There appears to be a low to medium potential for conflicts between the NRL and the Bellehelen Mining District based on the following: ▸ Distance between the NRL and historically mined areas of the district and the currently identified areas of mineralization. ▸ Recent mining claims were staked and exploration efforts (Notice of Intent or Plan of Operation) exist within and adjacent to the NRL. ▸ Northwest-trending structures controlling high-grade silver and gold mineralization and favorable rock types appear to trend toward the NRL. ▸ Reportedly (BLM Tonopah), mineral exploration efforts were conducted at the Ajax Mine last year. Known mineral occurrences in the district are possibly associated with the regional scale Kawich-Toiyabe trend.	Conduct a limited Phase 2 investigation.
Clifford Mining District	Nye	21	M3-2-I M3-2-DS M3-2-FD1 (Clifford Mine and vicinity)	- Mining district location and outline shown on Plate is from NBMG Report 47 - Industry professionals - BLM (Tonopah) personnel - Previous knowledge of the mining district and area - Various NBMG publications - The Nevada Mineral Industry - Minerals Exploration Co website	As indicated in NBMG Report 47, the Clifford Mining District is traversed by the NRL. The areas visited included the main workings at Clifford that are located on the south side of the U.S. Highway 6.	High	There appears to be a high potential for conflicts between the NRL and the Clifford Mining District based on the following: ▸ The NRL traverses the mining district and bisects mining claims (reportedly approximately 135 claims totaling 2,700 acres exist in the mining district), and possibly mine workings. ▸ Favorable geologic environment for the occurrence of buried gold and silver ore-grade mineralization. ▸ Structures and/or favorable rock types controlling mineralization are traversed and/or close to the NRL. ▸ Ongoing exploration programs conducted by Castleworth Ventures, Inc., reportedly with estimated gold production in the 15,000- to 20,000- ounce range from shallow shafts and cuts, and two deeper shafts. ▸ Geotechnical issues associated with extensive underground mine workings. ▸ Cultural and archeological issues associated with historic structures. ▸ Land status issues associated with mining claims.	Conduct a Phase 2 investigation generally consistent with BLM Manual Section 3031-Energy and Mineral Resource Assessment and applicable guidelines set forth in BLM Manual 3060-Mineral Reports Classify the mineral potential and certainty of assessment as modified and presented in NBMG Open File Report 98-1 Mineral and Energy Resource Assessment of the Nellis Air Force Range.Prepare Mineral Reports (e.g., economic evaluation, appraisal, etc.) in general compliance with applicable guidelines set forth in BLM Manual Section 3060- Mineral Reports because a portion of the mining district is traversed by the NRL and the reported presence of ore reserves.

TABLE 1
SUMMARY OF MINERAL OCCURRENCES, CONFLICT PROBABILITY, AND PHASE 2 RECOMMENDATIONS

Occurrence						Conflict		
Area / Mining District	County	Plate ID No.	Data Sheet No.	Information Source	Location / Distance from NRL	Probability	Rationale	Phase 2 Recommendation
Warm Springs Area	Nye	22	M3-3-DS M3-3-I M3-3-FD1 (Hot Springs at Warm Springs)	- Field observations during reconnaissance - Nevada Geothermal Resources Map 141	The warm springs are located approximately 1 mile northeast of the NRL.	Low	There appears to be a low potential for conflicts between the NRL and the Warm Springs area based on the following: ▸ The NRL is located within approximately 1/2 mile of historically mined areas of the district. ▸ Favorable geologic environment for the occurrence of high-grade gold and silver, as well as base-metal ore-grade mineralization appear to extend into the NRL. ▸ Mineral reserves have been "verified" within the Tybo Mining District. ▸ Reportedly, there has been relatively recent (2000), planned exploration efforts directed at identifying six target areas of gold and silver mineralization. Microwave tower area is a potential clay source and consists of pervasively altered bleached and argillized rhyolite tuff.	Conduct a limited Phase 2 investigation.
Tybo Mining District (southern portion)	Nye	23	M3-4-DS M3-4-I M3-4-FD1 (Tybo Canyon 1/2 mile from Warm Springs) M3-4-FD2 (Microwave tower area) M3-4-FD3 (Tybo Canyon, south end, approximately 1/4 mile from Warm Springs)	- Mining district location and outline shown on Plate is from NBMG Report 47 - Previous knowledge and exploration work in the district - Various NBMG publications - The Nevada Mineral Industry	As indicated in NBMG Report 47, the Tybo Mining District is located approximately 1/2 mile north of the NRL. The areas visited included small workings at the southern end of the district and the microwave tower area located approximately 1/2 mile north of the NRL.	Medium	There appears to be a medium potential for conflicts between the NRL and the southern end of the Tybo Mining District based on the following: ▸ The NRL is located within approximately 1/2 mile of historically mined areas of the district. ▸ Favorable geologic environment for the occurrence of high-grade gold and silver, as well as base-metal ore-grade mineralization appear to extend into the NRL. ▸ Mineral reserves have been "verified" within the Tybo Mining District. ▸ Reportedly, there has been relatively recent (2000), planned exploration efforts directed at identifying six target areas of gold and silver mineralization. Microwave tower area is a potential clay source and consists of pervasively altered bleached and argillized rhyolite tuff.	Conduct a Phase 2 investigation generally consistent with BLM Manual Section 3031-Energy and Mineral Resource Assessment and applicable guidelines set forth in BLM Manual 3060-Mineral Reports. Classify the mineral potential and certainty of assessment as modified and presented in NBMG Open File Report 98-1 Mineral and Energy Resource Assessment of the Nellis Air Force Range.
Mercury Mountain Mining District	Nye	24	M3-5-DS M3-5-FD1 (Mercury Mountain)	- Mining district location and outline shown on Plate is from NBMG Report 47 - Various NBMG publications	As indicated in NBMG Report 47, the southern end of the Mercury Mountain Mining District is located approximately 4 miles north of the NRL. The majority of the historic mining areas are located approximately 7 miles north of the NRL.	Low	There appears to be a low potential for conflicts between the NRL and the Mercury Mountain Mining District based on the following: ▸ The NRL is located approximately 7 miles north of historically mined areas of the district. ▸ Mercury mineralization that appears to be associated with narrow veins and veinlets and some disseminated areas in altered volcanic rocks appears to have no discernable district-wide trend. Apparent absence of this type of mineralizing environment between the historically mined area and the NRL.	None at this time.

TABLE 1
SUMMARY OF MINERAL OCCURRENCES, CONFLICT PROBABILITY, AND PHASE 2 RECOMMENDATIONS

Occurrence						Conflict		
Area / Mining District	County	Plate ID No.	Data Sheet No.	Information Source	Location / Distance from NRL	Probability	Rationale	Phase 2 Recommendation
Reveille Mining District including the Arrowhead Mining District	Nye	25	(Arrowhead Mining District) M3-6-DS	- Mining district location and outline shown on Plate is from NBMG Report 47 - BLM (Tonopah) personnel - Various NBMG publications	As indicated in NBMG Report 47, the western side of the Arrowhead Mining District is located approximately 8 miles east of the NRL. The majority of the historic mining areas in both districts are located approximately 9 miles east of the NRL	Low	There appears to be a low potential for conflicts between the NRL and the Reveille and Arrowhead Mining Districts based on the following: ▸ Approximately 7 to 9 miles separates the NRL and the currently identified potential mineral resources. ▸ Presence of relatively narrow and localized silver, lead, zinc, and copper mineralization (veins in fractures and replacement deposits). ▸ Structures controlling mineralization and favorable rock types do not appear to trend toward the NRL. Apparently low potential for the occurrence of sand and gravel and other construction materials in the area on the west flank of the Reveille Range.	Conduct a limited Phase 2 investigation.
Reveille Mining District including the Arrowhead Mining District	Nye	26	(New Reveille Mine) M3-7-DS M3-7-FD1	- Mining district location and outline shown on Plate is from NBMG Report 47 - BLM (Tonopah) personnel - Various NBMG publications	As indicated in NBMG Report 47, the western side of the Reveille Mining District is located approximately 7 miles east of the NRL. The majority of the historic mining areas in both districts are located approximately 9 miles east of the NRL	Low	There appears to be a low potential for conflicts between the NRL and the Eden Mining District based on the following: ▸ Relatively large distance separates the NRL and the historically mined and currently identified areas of mineralization in the district. ▸ Small, narrow, localized areas of mineralization. ▸ Controls to the mineralization, structure and stratigraphy, as currently identified, do not appear to trend toward the NRL. ▸ Possible drill roads in the area. Reported, small-scale mining at the 5 Jokers Mine at the time of the 2004 initial field reconnaissance, approximately 5 miles west of the NRL.	Conduct a limited Phase 2 investigation.
Eden Mining District	Nye	27	M3-8-DS M3-8-I 1	- Mining district location and outline shown on Plate is from NBMG Report 47 - Local miners - Various NBMG publications	As indicated in NBMG Report 47, the eastern side of the Eden Mining District is located approximately 3 miles west of the NRL. The majority of the historic mining areas are located approximately 6 miles west of the NRL.	Low	There appears to be a low potential for conflicts between the NRL and the Eden Mining District based on the following: ▸ Relatively large distance separates the NRL and the historically mined and currently identified areas of mineralization in the district. ▸ Small, narrow, localized areas of mineralization. ▸ Controls to the mineralization, structure and stratigraphy, as currently identified, do not appear to trend toward the NRL. ▸ Possible drill roads in the area. Reported, small-scale mining at the 5 Jokers Mine at the time of the 2004 initial field reconnaissance, approximately 5 miles west of the NRL.	Conduct a limited Phase 2 investigation.

TABLE 1
SUMMARY OF MINERAL OCCURRENCES, CONFLICT PROBABILITY, AND PHASE 2 RECOMMENDATIONS

Occurrence				Information Source	Location / Distance from NRL	Conflict		Phase 2 Recommendation
Area / Mining District	County	Plate ID No.	Data Sheet No.			Probability	Rationale	
Reveille Valley Area	Nye	28	M3-9-DS M3-9-FD1 M3-9-FD2 M3-9-FD3	- Field observations during reconnaissance - BLM (Tonopah) personnel - Previous knowledge and field work in the mining district - Industry professionals - The Nevada Mineral Industry - minerals exploration co website	Areas visited are 0.5 mile to 2 miles west of the NRL.	Medium	There appears to be a medium potential for conflicts between the NRL and the Reveille Valley Area based on the following: ▸ The NRL is relatively close to the currently identified prospective areas. ▸ Unknown configuration and control of mineralization. ▸ Unknown trend of structures possibly controlling mineralization. ▸ Reported previous exploration programs by Pegasus Gold Corporation and Kennecott Exploration and a current minerals exploration program by Redhawk Resources Inc., including drilling as observed during the June 2004 initial field reconnaissance (referred to as the Alien Gold Project). ▸ Surface sample analysis and reported drill cutting analysis returned results indicative of high-level alteration in a high-sulfidation mineralizing system (Tingley and others, 1998). Tingley and others (1998) reported a moderate potential, certainty level B, for precious metal mineralization, for areas within the NTTR and in areas adjacent to the north of the NTTR.	Conduct a Phase 2 investigation generally consistent with BLM Manual Section 3031-Energy and Mineral Resource Assessment and applicable guidelines set forth in BLM Manual 3060-Mineral Reports. Classify the mineral potential and certainty of assessment as modified and presented in NBMG Open File Report 98-1 Mineral and Energy Resource Assessment of the Nellis Air Force Range.
Queen City Mining District	Nye	29	M3-10-DS M3-10-FD1 (Blackhawk Mine)	- Mining district location and outline shown on Plate is from NBMG Report 47 - BLM (Tonopah) personnel - Industry professionals - Various NBMG publications	As indicated in NBMG Report 47, the northern side of the Queen City Mining District is located approximately 2 miles southeast of the proposed rail corridor alignment. The majority of the historic mining areas are located approximately 3 miles southeast of the NRL.	Low	There appears to be a low potential for conflicts between the NRL and the Queen City Mining District based on the following: ▸ Apparent , small, narrow, localized areas of primarily mercury mineralization. ▸ In general, trends of structures controlling mineralization and favorable rock types do not appear to trend toward the NRL. Tingley and others (1998) reported a low potential, certainty level C, for the discovery of silver-gold deposits for areas of the Queen City Mining District within the NTTR. Previous and recent mining interest in the area.	Conduct a limited Phase 2 investigation.
Freiberg Mining District	Lincoln	30	M3-11-DS M3-11-FD1 (Freiberg Mine) M3-11-FD2 (Gravel pit east of Freiberg Mine) M3-11-I	- Mining district location and outline shown on Plate is from NBMG Report 47 - Various NBMG publications	As indicated in NBMG Report 47, the northern side of the Freiberg Mining District is located approximately 1/2 mile south of the NRL. The majority of the historic mining areas are located approximately 4 miles south of the NRL.	Low	There appears to be a low potential for conflicts between the NRL and the Freiberg Mining District based on the following: ▸ Distance between the NRL and identified mineral resource areas of the district. ▸ Mines are generally in the southern end of the mining district and are small and localized replacement beds in limestone near an intrusive. Structural and lithologic controls to mineralization do not appear to trend toward the NRL.	None at this time.

TABLE 1
SUMMARY OF MINERAL OCCURRENCES, CONFLICT PROBABILITY, AND PHASE 2 RECOMMENDATIONS

Occurrence						Conflict		
Area / Mining District	County	Plate ID No.	Data Sheet No.	Information Source	Location / Distance from NRL	Probability	Rationale	Phase 2 Recommendation
Quinn Canyon Mining District Area (Sharp Mining District area to the north)	Nye & Lincoln	31	- M3-12-FD1 (Sharp Mining District per Tingley NBMG Report 47) range front area - rhyolite instrusive w/limestone - M3-12-FD2 (Sharp Mining District per Tingley NBMG Report 47) range front area - brecciated rock w/quartzite - M3-13Data Sheets - M3-13-FD1 (fluorspar deposits - M3-13-FD2 (rock cairns(?) archeological)	- Mining district location and outline shown on Plate is from NBMG Report 47 - Industrial Mineral Deposits in Nevada Map 142 - Various NBMG publications	As indicated in NBMG Report 47, the closest, southernmost lobe of this large district (including the Sharp Mining District) is approximately 1/2 to 1 mile north of the NRL. The majority of the historic mining areas are located approximately 5 miles north of the NRL. The areas visited were 4 to 6 miles north of the NRL and included the major mine workings in this large district.	Low	There appears to be a low potential for conflicts between the NRL and the Quinn Canyon/Sharp Mining Districts based on the following: ▸ Distance between the NRL and historically mined and currently identified mineral resource areas of the district. The highest concentration of fluorspar deposits in Nevada are approximately 10 miles north-northwest of the NRL and trend approximately north-south, to the east of Quinn Canyon.	None at this time.
Quinn Canyon Mining District Area (Sharp Mining District area to the north)	Nye & Lincoln	32	- M3-12-FD1 (Sharp Mining District per Tingley NBMG Report 47) range front area - rhyolite instrusive w/limestone - M3-12-FD2 (Sharp Mining District per Tingley NBMG Report 47) range front area - brecciated rock w/quartzite - M3-13Data Sheets - M3-13-FD1 (fluorspar deposits - M3-13-FD2 (rock cairns(?) archeological)	- Mining district location and outline shown on Plate is from NBMG Report 47 - Industrial Mineral Deposits in Nevada Map 142 - Various NBMG publications	As indicated in NBMG Report 47, the closest, southernmost lobe of this large district (including the Sharp Mining District) is approximately 1/2 to 1 mile north of the NRL. The majority of the historic mining areas are located approximately 5 miles north of the NRL. The areas visited were 4 to 6 miles north of the NRL and included the major mine workings in this large district.	Low	There appears to be a low potential for conflicts between the NRL and the oil and gas lease area on the western side of Garden Valley. This low potential for conflict is based on the following:Apparent absence of obvious exploration activity on the leases. Leases are not located in a known oil and gas producing area. Leases surround a previously drilled oil well that is classified as a "dry hole" according to the Nevada Oil and Gas Well Map (Hess, 2001).	None at this time.
Oil and Gas Leases on the western side of Garden Valley (just north of the Frieberg Mining District)	Lincoln	33	M3-14-I	- BLM LR2000 database - Interview	Area of approximately 12 oil and the gas leases. The NRL alignment traverses some of these oil and gas leases. Oil and gas well is surrounded by the leases.	Low	There appears to be a low potential for conflicts between the NRL and the oil and gas lease area on the western side of Garden Valley. This low potential for conflict is based on the following:Apparent absence of obvious exploration activity on the leases. Leases are not located in a known oil and gas producing area. Leases surround a previously drilled oil well that is classified as a "dry hole" according to the Nevada Oil and Gas Well Map (Hess, 2001).	Conduct a limited Phase 2 investigation.
Heizer Sculpture / Landform Area (aka "The City") and GV3	Nye	34	M3-15-FD1 M3-15-FD2 M3-15-FD3	- BSC and local residents	The three NRL alignments in this area are 2 miles north, 4 miles north, and 2 miles south of the Heizer sculpture area.	Low	There appears to be a low potential for mineral and energy occurrence/resource-related conflicts between the NRL and the Heizer Sculpture Area. It is likely conflicts may exist with regard to private party ownership, view shed, and other issues.	None at this time.

TABLE 1
SUMMARY OF MINERAL OCCURRENCES, CONFLICT PROBABILITY, AND PHASE 2 RECOMMENDATIONS

Occurrence						Conflict		
Area / Mining District	County	Plate ID No.	Data Sheet No.	Information Source	Location / Distance from NRL	Probability	Rationale	Phase 2 Recommendation
Oil & Gas lease area; Golden Gate Range, west side of Coal Valley	Nye	35	M4-1-I	- BLM LR2000 database - Interview	The northern portion of the NRL traverses the northern portion of the easternmost section of the oil and gas leases.	Low	There appears to be a low potential for conflicts between the NRL and the oil and gas leases in the Golden Gate Range based on the following: ▸ Apparent absence of obvious exploration activity on the leases. ▸ Leases are on the western flank of Coal Valley, an area with previous oil and gas exploration. ▸ Apparent absence of exploration or other activity on the leases.	Conduct a limited Phase 2 investigation.
North end of the Seaman Range Mining District / Timber Pass Area	Nye & Lincoln	36	M4-2-DS M4-2-FD1 M4-2-FD2	- Mining district location and outline shown on Plate is from NBMG Report 47 - Industry professionals	As indicated in NBMG Report 47, the northern portion of the Seaman Mining District is traversed by the southernmost NRL alternative. The majority of the historic mining areas are located approximately 3 miles south and southwest of the NRL.	Low	There appears to be a low potential for conflict between the NRL and the Seaman Range Mining District based on the following: ▸ Readily available data suggests minimal mineral development activity (or an absence of data) is evident in this area. ▸ Two sections of Notice of Intents in the area.	Conduct a limited Phase 2 investigation.
Oil & Gas lease area, northeast of Fox Mountain, at the north end of the Seaman Range	Nye & Lincoln	37	M4-3-FD1	- BLM LR2000 database - Interview	Area of 11 oil and gas leases located approximately 7 miles northeast of the NRL.	Low	There appears to be a low potential for conflicts between the NRL and the oil and gas leases in area northeast of Fox Mountain based on the following: ▸ Apparent absence of obvious exploration activity on the leases. ▸ Distance (approximately 7 miles) between these leases and the NRL.	None at this time.
Comet Mining District area	Lincoln	38	M4-4-DS M4-4-FD1	- Mining district location and outline shown on Plate is from NBMG Report 47 - Various NBMG publications	As indicated in NBMG Report 47, the southern edge of the Comet Mining District is located approximately 4 mile north of the NRL. The majority of the historic mining areas are located approximately 6 miles north of the NRL.	Low	There appears to be a low potential for conflicts between the NRL and the Comet Mining District based on the following: ▸ Distance (approximately 4 to 6 miles) between the NRL and historically mined and currently identified mineral resources in the district. ▸ Extensions of the types of mineralization at the mining district appear to generally trend toward the NRL. The extent and strength of quartz veins and localized bedded replacement deposits is unknown.	Conduct a limited Phase 2 investigation.
Bennett Pass Area / Bennett Springs Area – trilobite fossil area, carbonate rock, warm springs	Lincoln	39	M4-5-DS1 (carbonate rock) M4-5-DS2 (warm springs) M4-5-FD1 (trilobite fossil area) M4-5-FD2 (trilobite fossil area) M4-5-I1 (trilobite fossil area) M4-5-FD1a (limestone quarry)	- Nevada State Parks, Park Supervisor at Cathedral Gorge State Park - Nevada Geothermal Resources Map 141 - Various NBMG publications	Various potential resources within the Bennett Pass area are located in close proximity to the NRL.	Low to Medium	There appears to be a medium potential for conflicts between the NRL and the Bennett Pass area based on the following: ▸ Close proximity of a limestone quarry and geothermal resources. Significant" paleontological site is currently being studied by various universities and paleontology professionals/experts; however, the site reportedly is located 3 to 5 miles south of the NRL.	Conduct a limited Phase 2 investigation.
Chief (Caliente) Mining District	Lincoln	40	M4-6-DS M4-6-FD1	- Mining district location and outline shown on Plate is from NBMG Report 47 - Various NBMG publications	As indicated in NBMG Report 47, the southernmost extent of the Chief Mining District is located approximately 1 mile northwest of the westernmost NRL alternative. The majority of the historic mining areas are located approximately 2 to 3 miles northwest of the westernmost NRL alternative.	Low	There appears to be a low potential for conflicts between the NRL and the Chief Mining District based on the following: ▸ Known mineral occurrences are located along the eastern side of the Chief Mountains, approximately 2 to 3 miles west of the western segment of the NRL. ▸ Most gold, silver, and lead mineralization occurs in fissure veins in quartzite or in the breccia zones or small replacement deposits that do not appear to trend toward the NRL. ▸ Small recorded production from the mining district.	None at this time.

TABLE 1
SUMMARY OF MINERAL OCCURRENCES, CONFLICT PROBABILITY, AND PHASE 2 RECOMMENDATIONS

Occurrence					Conflict		
Area / Mining District	County	Plate ID No.	Data Sheet No.	Information Source	Location / Distance from NRL	Probability	Rationale	Phase 2 Recommendation
Pozzolan Placer Area	Lincoln	41	M4-7-FD1 M4-7-I	- BLM (Tonopah and Ely) personnel - BLM LR2000 database	Approximately 4 miles south of Pioche and north of Cathedral Gorge State Park, west of Hwy 93 and east of the Highland Range. The Pozzolan Placer Area at its closest is 2 miles northeast of the NRL.	Low to Medium	There appears to be a low to medium potential for conflicts between the NRL and the Pozzolan Placer Area based on the following: ▸ Distance (approximately 2 to 4 miles) between the NRL and historically mined and currently identified areas of mineral resources in the district (low). ▸ Unknown extent of pozzolan material. ▸ Possibility of related resources (silica, clay) in the area.	Conduct a limited Phase 2 investigation.
Panaca Mining District, including areas east and southeast	Lincoln	42	M4-8-DS1 (U and Ti occurrences) M4-8-DS2 (diatomite / hot spring complex) M4-8-FD1 (diatomite / hot spring complex) M4-9-FD1 (east of Panaca, Plans of Operation) M4-10-FD1 (southeast of Panaca, Notice of Intent and Plans of Operation)	- Mining district location and outline shown on Plate is from NBMG Report 47 - BLM LR2000 database - Various NBMG publications	As indicated in NBMG Report 47, the southern edge of the Panaca Mining District (M4-8) is located approximately 0.5 mile east of Panaca, approximately 4 miles north of the NRL. Area M4-9 is an area comprised of two sections identified by the BLM LR 2000 as having Plans of Operation filed. It is located approximately 2 miles north of the NRL. Area M4-10 is an area of 4 noncontiguous sections identified by the BLM LR2000 as having both Plans of Operation and Notice of Intent filed. This area is located approximately 1 mile northeast and southwest of the NRL.	Low to Medium	There appears to be a low to medium potential for conflicts between the NRL and the Panaca Area based on the following: ▸ Proximity to the NRL of potential resources in the general area such as perlite and diatomaceous earth. ▸ Notices of Intent and Plans of Operation indicating recent development of mineral development activity. ▸ Unknown extent of potential mineral resources in the area. ▸ Apparent low recorded diatomaceous earth production for the area.	Conduct a limited Phase 2 investigation.
Panaca Mining District, including areas east and southeast	Lincoln	43	M4-8-DS1 (U and Ti occurrences) M4-8-DS2 (diatomite / hot spring complex) M4-8-FD1 (diatomite / hot spring complex) M4-9-FD1 (east of Panaca, Plans of Operation) M4-10-FD1 (southeast of Panaca, Notice of Intent and Plans of Operation)	- Mining district location and outline shown on Plate is from NBMG Report 47 - BLM LR2000 database - Various NBMG publications	As indicated in NBMG Report 47, the southern edge of the Panaca Mining District (M4-8) is located approximately 0.5 mile east of Panaca, approximately 4 miles north of the NRL. Area M4-9 is an area comprised of two sections identified by the BLM LR 2000 as having Plans of Operation filed. It is located approximately 2 miles north of the NRL. Area M4-10 is an area of 4 noncontiguous sections identified by the BLM LR2000 as having both Plans of Operation and Notice of Intent filed. This area is located approximately 1 mile northeast and southwest of the NRL.	Low to Medium	There appears to be a low to medium potential for conflicts between the NRL and the Panaca Area based on the following: ▸ Proximity to the NRL of potential resources in the general area such as perlite and diatomaceous earth. ▸ Notices of Intent and Plans of Operation indicating recent development of mineral development activity. ▸ Unknown extent of potential mineral resources in the area. ▸ Apparent low recorded diatomaceous earth production for the area..	Conduct a limited Phase 2 investigation.
Panaca Mining District, including areas east and southeast	Lincoln	44	M4-8-DS1 (U and Ti occurrences) M4-8-DS2 (diatomite / hot spring complex) M4-8-FD1 (diatomite / hot spring complex) M4-9-FD1 (east of Panaca, Plans of Operation) M4-10-FD1 (southeast of Panaca, Notice of Intent and Plans of Operation)	- Mining district location and outline shown on Plate is from NBMG Report 47 - BLM LR2000 database - Various NBMG publications	As indicated in NBMG Report 47, the southern edge of the Panaca Mining District (M4-8) is located approximately 0.5 mile east of Panaca, approximately 4 miles north of the NRL. Area M4-9 is an area comprised of two sections identified by the BLM LR 2000 as having Plans of Operation filed. It is located approximately 2 miles north of the NRL. Area M4-10 is an area of 4 noncontiguous sections identified by the BLM LR2000 as having both Plans of Operation and Notice of Intent filed. This area is located approximately 1 mile northeast and southwest of the NRL.	Low to Medium	There appears to be a low to medium potential for conflicts between the NRL and the Panaca Area based on the following: ▸ Proximity to the NRL of potential resources in the general area such as perlite and diatomaceous earth. ▸ Notices of Intent and Plans of Operation indicating recent development of mineral development activity. ▸ Unknown extent of potential mineral resources in the area. ▸ Apparent low recorded diatomaceous earth production for the area.	Conduct a limited Phase 2 investigation.

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SUMMARY OF MINERAL OCCURRENCES, CONFLICT PROBABILITY, AND PHASE 2 RECOMMENDATIONS

Occurrence						Conflict		
Area / Mining District	County	Plate ID No.	Data Sheet No.	Information Source	Location / Distance from NRL	Probability	Rationale	Phase 2 Recommendation
Little Mountain Mining District	Lincoln	45	M4-11-DS M4-11-FD1	- Mining district location and outline shown on Plate is from NBMG Report 47 - Various NBMG publications	As indicated in NBMG Report 47, the northern side of the Little Mountain Mining District is located approximately 4 miles south of the NRL.	Low	There appears to be a low potential for conflicts between the NRL and the Little Mountain Mining District based on the following: ▸ Relatively large distance (approximately 4 miles) between the NRL and reported mineral occurrences in the district. ▸ Small, localized areas of mineralization associated with an intrusive stock. ▸ Low likelihood that the mineralization extends to the NRL.	None at this time.
Caliente Area (includes Acoma Mining District and Antelope Canyon)	Lincoln	46	M4-12-DS1 (quartzite quarry) M4-12-FD1 (quartzite quarry) M4-12-FD2 (cement(?) batch plant) M4-12-DS3 (zeolite deposits) M4-12-FD3 (zeolite deposits) M4-12-DS4 (perlite deposits) M4-12-DS4a (Acoma Mining District / Clover Valley - perlite deposits) M4-12-FD4 (perlite deposits) M4-12-FD5 (hot spring) M4-12-FD5 (hot spring)	- Nevada Geothermal Resources Map 141 - Nevada Industrial Mineral Deposits in Nevada Map 142 - Various NBMG publications	Various potential resources occur in this area and are located approximately 0.5 to 2 miles from the NRL.	Medium	There appears to be a medium potential for conflicts between the NRL and the Caliente Area. This medium potential for conflict is based on the following: ▸ The proximity of perlite, zeolite, quartzite, and geothermal occurrences in the area of the NRL. ▸ Current direct application of geothermal resources.	Conduct a Phase 2 investigation generally consistent with BLM Manual Section 3031-Energy and Mineral Resource Assessment. and applicable guidelines set forth in BLM Manual 3060-Mineral Reports. Classify the mineral potential and certainty of assessment as modified and presented in NBMG Open File Report 98-1 Mineral and Energy Resource Assessment of the Nellis Air Force Range.
Montezuma Mining District	Esmeralda	47	M1-10-DS1 M1-10-FD1	- Mining district location and outline shown on Plate is from NBMG Report 47 - Various NBMG publications	The majority of the mine working sassociated with this mining district are located approximately 5 to 6 miles west of the proposed NRL, on the western flank of the Montezuma Range.	Low	There appears to be a low potential for conflicts between the NRL and the Caliente Area. This low potential for conflict is based on the following: ▸ Distance between the NRL and the majority of mine workings in the district is approximately 5 to 6 miles. ▸ Relatively narrow and localized silver and lead mineralization (veins in fractures and replacement deposits). ▸ Structures controlling mineralization and favorable rock types do not appear to trend toward the NRL. ▸ Apparent low potential for sand and gravel and other construction materials in the area on the east flank of the Montezuma Range.	None at this time.

TABLE 1
SUMMARY OF MINERAL OCCURRENCES, CONFLICT PROBABILITY, AND PHASE 2 RECOMMENDATIONS

Occurrence						Conflict		
Area / Mining District	County	Plate ID No.	Data Sheet No.	Information Source	Location / Distance from NRL	Probability	Rationale	Phase 2 Recommendation
North and East Reveille and SR4	Nye	48	M3-16-FD1 (SR4)	- Field Reconnaissance	SR4 begins near the intersection of US-6 and NV-375 near Warm Springs and traverses east across Hot Creek Valley, roughly paralleling NV-375, for approximately 10 miles. Alignment SR4 then passes through a small valley between the northern end of the Reveille Range and the southern end of the Pancake Range, then turns south and traverses the eastern flank of the Reveille Range along the western edge of Railroad Valley. South of Fred's Well, SR4 turns and continues east to a location near the southern end of the Quinn Canyon Range.	Low	There appears to be a low potential for conflicts between the NRL and the Caliente Area. This low potential for conflict is based on the following: ▸ Apparent abasence of known mineral resources in the area. ▸ Presence of small, weakly developed zones of rock alteration observed at only one relatively isolated area of the proposed alternate alignment. ▸ Although several claim posts were observed in the small area of weak alteration, based on field obsevations, at this time, they are not considered significant. ▸ Structures controlling weak mineralization and favorable rock types mentioned above do not appear to trend toward the NRL. ▸ Apparent low potential for sand and gravel and other construction materials in the area on the east flank of the Reveille Range.	None at this time.
Golden Gate Mining District and GV4	Nye	49	M3-17-DS1 M3-17-FD1 (GV4) M3-17-FD2 (GV4)	- Mining district location and outline shown on Plate is from NBMG Report 47 - Various NBMG publications	The Golden Gate Mining District, and the majority of the historic mining areas, is located approximately 2 to 3 miles west of this proposed alternate alignment.	Low	There appears to be a low potential for conflicts between the NRL and the Caliente Area. This low potential for conflict is based on the following: ▸ Distance, approximately 2 to 3 miles, between proposed alternate alignment GV4 and the small historic mining area. ▸ Relatively narrow and localized silver and lead mineralization (veins in fractures and replacement deposits). ▸ Although the mineralizing structures appear to trend toward the alternate alignment, they do not appear to extend this far. ▸ Apparent low potential for sand and gravel and other construction materials in the area on the east flank of the Golden Gate Range.	None at this time.

TABLE 2
DEFINITION OF MINERAL RESOURCE POTENTIAL AND CERTAINTY OF ASSESSMENT*

Definitions of Mineral Resource Potential

LOW (L)	Mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics define a geologic environment in which the existence of resources is unlikely. This broad category embraces areas with dispersed but insignificantly mineralized rock as well as areas with few or no indications of having been mineralized.
MODERATE (M)	Mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics indicate a geologic environment favorable for resource occurrence, where interpretations of data indicate a reasonable likelihood of resource accumulation, and (or) where an application of mineral deposit models indicates favorable ground for the specified type(s) of deposits.
HIGH (H)	Mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics indicate a geologic environment favorable for resource occurrence, where interpretations of data indicate a high degree of likelihood for resource accumulation, where data support mineral-deposit models indicating presence of resources, and where evidence indicates that mineral concentration has taken place. Assignment of high resource potential to an area requires some positive knowledge that mineral-forming processes have been active in at least part of the area.
UNKNOWN (U)	Mineral resource potential is assigned to areas where information is inadequate to assign low, moderate, or high levels of resource potential.
NO (N)	Mineral resource potential is a category reserved for a specific type of resource in a well-defined area.

Definitions of Level of Certainty

A	Available information is not adequate for determination of the level of mineral resource potential.
B	Available information suggests the level of mineral resource potential.
C	Available information gives a good indication of the level of mineral resource potential.
D	Available information clearly defines the level of mineral resource potential.

*Modified from Goudarzi 1984.

Relationships Between Levels of Resource Potential and Certainty

INCREASING LEVEL OF POTENTIAL →

U/A	UNKNOWN POTENTIAL	H/B	HIGH POTENTIAL	H/C	HIGH POTENTIAL	H/D	HIGH POTENTIAL
		M/B	MODERATE POTENTIAL	M/C	MODERATE POTENTIAL	M/D	MODERATE POTENTIAL
		L/B	LOW POTENTIAL	L/C	LOW POTENTIAL	L/D	LOW POTENTIAL
						N/D	NO POTENTIAL

LEGEND

LAND OWNERSHIP

- BLM
- DEPARTMENT OF DEFENCE
- DEPARTMENT OF ENERGY
- FISH & WILDLIFE SERVICE
- NATIVE AMERICAN RESERVATION
- NATIONAL PARK SERVICE
- NEVADA STATE
- US FOREST SERVICE
- PRIVATE LAND
- WILDERNESS STUDY AREAS

CLAIMS

PLACER CLAIMS	MILL CLAIMS	LODE CLAIMS
DENSITY	DENSITY	DENSITY
1 - 25	1 - 25	1 - 25
26 - 50	26 - 50	26 - 50
51 - 75	51 - 75	51 - 75
76+	76+	76+

GEOTHERMAL WELL TYPE

- PERMITTED WELLS
- DIRECT - USE APPLICATIONS
- HOT HEAT FLOW WELLS (> 100 C/KM)
- HOT SPRING (> 37C)
- HOT WELL (> 37C)
- WARM HEAT FLOW WELLS (< 100 C/KM)
- WARM SPRING (<= 37C)
- WARM WELL (<= 37C)

MINING DISTRICTS AND MINERAL AND ENERGY OCCURRENCE AREAS

- MINING DISTRICTS
- OIL AND GAS WELLS
- PALEO: HOT SPRINGS
- PALEO: COLD SPRINGS AND GYPSUM MOUND
- SPRING COMPLEX

MINERAL AND ENERGY LAND STATUS

- 311121 - OIL & GAS LEASES NON-COMPETITIVE
- 321000 - GEOTHERMAL LEASES NON-COMPETITIVE
- 360413 - MINERAL MATERIALS DISPOSAL (SALEABLE FREE USE PERMITS)
- 361113 - MINERAL MATERIALS NEGOTIATED
- 362113 - MINERAL MATERIALS FREE USE PERMIT GOVERNMENT
- 380910 - SURFACE MANAGEMENT PLANS OF OPERATION
- 380913 - SURFACE MANAGEMENT NOTICE OF INTENT TO OPERATE

CALIENTE ALIGNMENT STATUS

ALIGNMENTS BASED ON APPENDIX A, REVISION 5, 28 MARCH 2005

- ALTERNATE
- COMMON

14. Goldfield 14.1 14.2 APPROXIMATE AREA EVALUATED DURING THE LIMITED INITIAL FIELD INVESTIGATION, JUNE - OCTOBER 2004 AND APRIL 2005 WITH FIELD DATA SHEET NUMBER DESIGNATION

PROJECT LOCATION PLAN

REFERENCES

1. Land ownership data provided by the United States Department of the Interior Bureau of Land Management Nevada State Office Mapping Sciences, updated 2003.
2. Geothermal well type and spring complex data provided by L. Shevnell and L. Garside, Nevada Geothermal Resources, 2003 (M141).
3. Claims amd Mineral and Energy Land Status data provided by the Bureau of Land Management, LR 2000 Database, September 2004.
4. Mining Districts defined by NBMG Report 47 Mining Districts of Nevada, Tingley, 1988
5. Oil and Gas well locations from Nevada Oil and Gas Wells, 1907-2001 by Rondald H. Hess. Nevada Bureau of Mines and Geology, December 2001.
6. Hot and cold spring and gypsum mound data provided by the Department of Energy Office of Civilian Radioactive Waste Management, Yucca Mountain Site Characterization Office, March 1999.
7. GIS layers for topographic base, mining districts, hot springs, paleo springs, geothermal well data and mineral and energy land status provided by Gnomon, Inc.

PHASE 1, CALIENTE RAIL CORRIDOR YUCCA MOUNTAIN PROJECT, NEVADA

Preliminary Mineral and Energy Resource Occurrence Report

MINING DISTRICTS AND MINERAL/ENERGY OCCURRENCES PLATE 1

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Ninyo & Moore Geotechnical and Environmental Sciences Consultants

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APPENDIX

DATA SHEETS AND SELECTED BACKGROUND DATA
(CD-ROM)

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
SPECIAL INSTRUCTION SHEET

1. QA: N/A

This is a placeholder page for records that cannot be scanned.

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07/19/2007	ATTN to: ENG.20070905.0013
4. Author Name(s)	**5. Authorization Organization**
N/A	Shannon & Wilson

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Mineral and Energy Resource Occurrence Report Caliente Rail Corridor, APPENDIX: Data Sheets & Selected Background Data

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Validation of complete file transferred. All files copied. Software used: AutoCad 2007, Corel Photo-Paint 8.0, MS Word, Adobe Acrobat 7.0 & Excel

14. RPC Electronic Media Verification

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SEP 17 2007 TChurch /BSC-BS

MD5 Validation

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02/03/2005  04:40p           860,289 12 Stonewall Mining District.pdf
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